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UPPER PALEOLITHIC SITES IN THE TYTYLVAAM RIVER VALLEY (POLAR CHUKOTKA)

Introduction

Chukotka has always attracted the attention of prehistorians. Over many millennia, it has been a crossroads of migration routes leading to extreme northeastern Asia and further east into America. Archaeological sites are so far the only source of evidence documenting prehistoric migrations. In fact, archaeology is the only discipline dealing both with the origins of these ancient traditions and with the cultural and ethnic ties between ancient cultures on both sides of the Bering Strait.

For that reason, the discovery of several Upper Paleolithic sites in the Tytylvaam River valley, western Chukotka, situated beyond 67° N, was a landmark in the archaeology of this region. This is due not only to the location of the sites in the northernmost zone of the region, but also to their stratigraphic context and the availability of radiocarbon dates. Geochronological data make these sites more informative compared to others such as Ulkhum and Kurupka I, which have not been subjected to stratigraphic studies or dated by radiocarbon (see (Dikov, 1993)).

History of research

The study of Tytyl antiquities was started 25 years ago by members of two archaeological projects – the Lena Archaeological Expedition (LAE), headed my Y.A. Mochanov, and the North-East Asiatic Complex Archaeological Expedition (NEACAE), headed by N.N. Dikov. In 1977, their expeditions independently conducted reconnaissance in the coastal zone of Lake Tytyl (Fig. 1). As a result of this work, the LAE discovered several sites dating from various periods and known as Tytyl I – V, while the NEACAE team headed by M.A. Kiryak discovered seven sites and, in 1978, began systematic research in the Tytyl zone.

Initially, work focused on the southern part of the lake along the coast, at the permanent fishing place of the local sovkhoz (state-owned farm). Here, a migration route of wild deer passes by a narrow section of the lake. The strategy of the deer hunters has apparently remained unchanged over millennia, for traces of Holocene human occupation such as campsites, workshops, etc., concentrate precisely around this passage. A total of eight sites of varying age were discovered.

In the central zone of Lake Tytyl, we discovered and excavated the Mesolithic sites of Tytyl I – III and Tytyl IV locus 3. In terms of technology, typology, and possibly chronology, these sites are similar to the Sumnagin sites in Yakutia, which are at least 8000 years old. Highly informative materials were obtained in the course of excavations at Late Neolithic sites such as the underground dwelling at Tytyl IV, with a radiocarbon date of 4290 ± 100 (MAG-1094). At Tytyl V, a large excavation area (200 sq. m) revealed deposits representing periods from the Mesolithic to the Post-Neolithic. Excavations are underway both in the lower Tytyl zone, containing nine Early and Late Neolithic sites, and in the upper Tytyl zone, where fourteen sites spanning the period from the Mesolithic to the Post-Neolithic are situated.

The total number of sites discovered in the coastal zone of Lake Tytyl, then, is more than thirty. Twenty-

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three of them represent the Late Neolithic North Chukotkan culture, whereas others are related to various cultural traditions between the Upper Paleolithic and the Neolithic (Kiryak, 1993, 1996b, 1999). In 1996, when the boundaries of the study area had shifted to the north, we conducted a reconnaissance near the mouth of the Tytylvaam River where it flows into the northeastern part of Lake Tytyl (Fig. 2). A wedge-shaped core and an elongated blank found on the eroded surface of the terrace encouraged us to continue the search for more ancient sites on the coast. In 1998, a more detailed reconnaissance was carried out, and in 2000 and 2002, five Upper Paleolithic sites were discovered during the course of excavations (Tytylvaam II – V and Podgornaya locus 1)*.

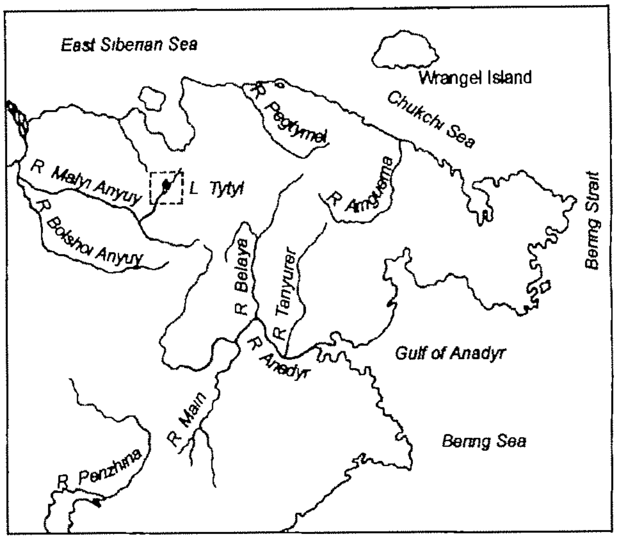

Fig. 1. Location of Lake Tytyl.

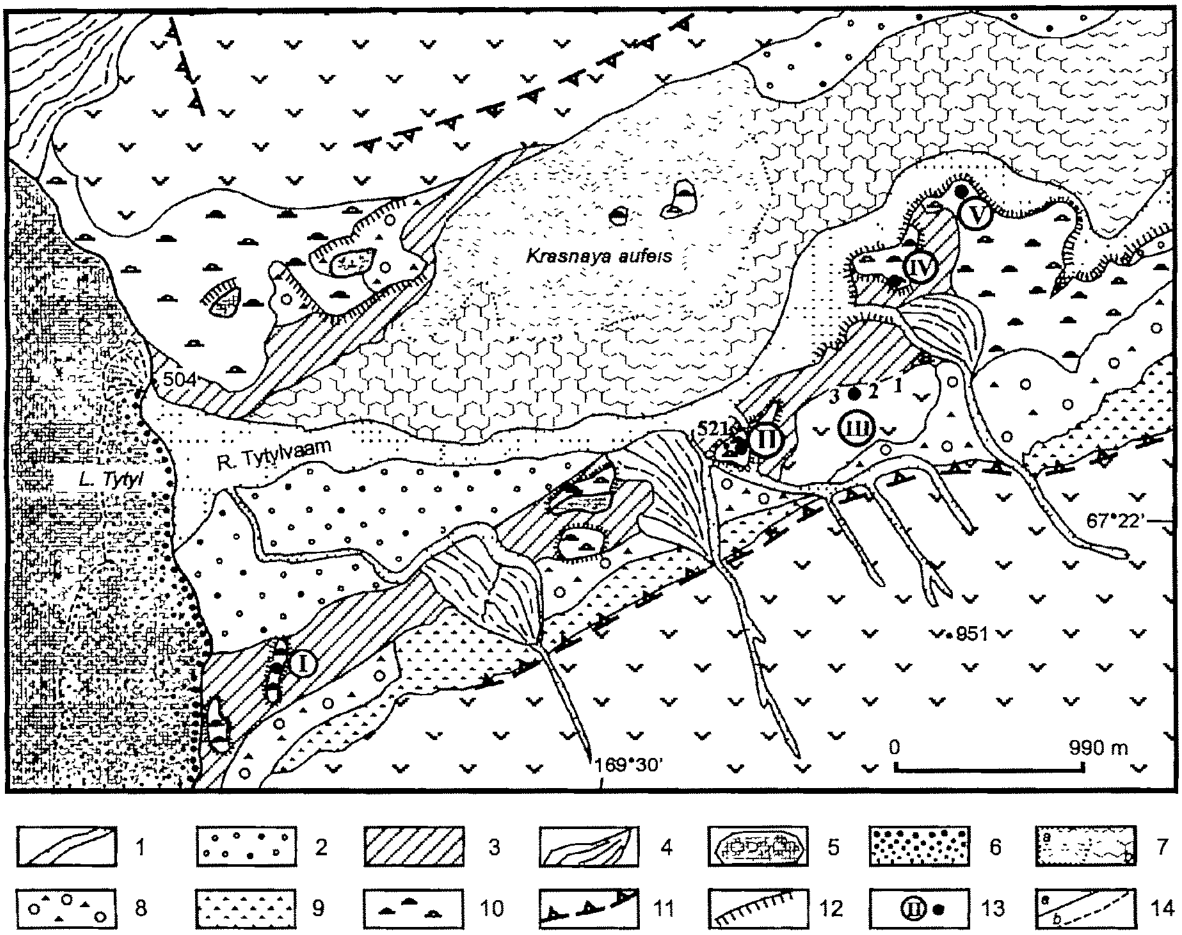

Fig. 2. Geomorphological scheme of the Tytylvaam River valley.
1 – river bed, *2* – flood-plain 1.5 – 2 m high; *3* – first fluvial terrace above flood-plain 3 – 4 m high, *4* – alluvial fans, *5* – lakes, *6* – shoreline shoals; *7* – aufeises (perennial (a) and zones of seasonal melting (b)), *8* – moraine of the last Late Pleistocene glacial, *9* – similar moraine covered by scree beneath the slopes, *10* – fragments of periglacial terraces 8 – 10 m high, *11* – shoulders of troughs, *12* – erosional benches, *13* – archaeological sites (numbered); *14* – geomorphological boundaries (established (a) and presumable (b)).

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* Findings from the 2002 season are not discussed in the present article because the material is currently being analyzed in the laboratory.

The discovery of archaeological sites in the Tytylvaam River valley in the immediate proximity of Lake Tytyl comes as no surprise. The selection of this specific place for numerous and possibly long-term campsites was not coincidental, but rather was motivated by favorable geographic and geomorphological conditions.

Geographical setting and geomorphological situation

The area in question is situated in the southeastern part of the Anyuy Plateau and in the northwestern part of the Anadyr Plateau, on the southern slope of the Ilerney Ridge, northwestern Chukotka. This ridge is a separate massif more than 140 km long, stretching to the northwest. Elevations reach 1,300 – 1,500 m above sea level in the axial part of the ridge and 950 – 1,000 m in the periphery and below. Most of the ridge is a massive highland with flat or round summits. Only in its central, most elevated, part are the landforms close to the alpine type. Principal rivers along the northern and the southern slopes of the ridge are connected by valleys Such valleys exist between the Tytylvaam and Tytliutin Rivers, on the one hand, and the tributaries of the Yarakvaam River flowing into the Chaun Inlet of the East Siberian Sea. The direct distance between the northern Tytyl coast and the Chaun Inlet is only 150 km. The modern climate of this territory is subarctic and sharply continental. The duration of winter is eight months, and the summer is short. Based on data from the Ilirney meteostation, the average annual temperature is –13° C. The coldest months are December and January (–30 to –40° C, sometimes –65° C). Average summer temperatures fluctuate between +13° C and +15° C, and the warmest month is July (+24° C to +34° C). In January through March, the number of windy days is at a maximum, and the predominant winds are northern by northwestern and northern by northeastern. The annual rainfall is 400 mm, with August being the most humid month The rivers begin to freeze in late October and thaw in late May.

Vegetation is extremely scarce, mostly represented by lichens, mosses, dwarf birch, and purple willow. However, in the Malyi Anyuy valley, situated 35 km to the south, the plant diversity is higher, including such taxa as poplar, alder, chousingia, spruce, and elfin pine wood.

The territory covered by our archaeological studies is situated on the southern slope of the Ilyrney Ridge on the left bank of the Tytylvaam River. It occupies part of the valley and surrounding slopes from the eastern coast of Lake Tytyl to the mouth of an anonymous left tributary (see Fig. 2). The stratigraphic profile of the Ilirney Ridge includes sedimentary, sedimentary-volcanic, and volcanic deposits dating to the Upper Triassic, Lower, Middle, and Upper Jurassic, Lower and Upper Cretaceous, and Paleogene epochs.

The mountain slopes delimiting the valley are composed of volcanic rocks, mostly lavas. These include andesite, basaltic andesite, dacite, as well as tuffs, tuff lavas and tuff breccias, and their visible depth is 100 – 1000 m. The rocks are intersected by dykes composed of diorite porphyrite, andesite, and dacite andesite.

In the middle Tytylvaam River basin, where the highest summit is Victory Peak (1,521 m), volcanic formations, mostly tuffs, predominate. Near the source of the Burlivaya River, subvolcanic liparites appear on the modern surface. Also, in the Tytylvaam River valley and in that of its left tributary, the Stremninnaya, Early and Late Cretaceous granodiorites and leucocrate granites are visible.

Loose deposits in the bottom part of the valley are formed by shallow glacial and fluvio-glacial deposits of the Late Glacial period, such as blocks, boulders, shingle beds, and sandy loams. Low terraces, river and stream plains, and alluvio-proluvial fans date from the beginning of the Late Holocene and are composed of shingles, sands, sandy loams, loams, boulders, blocks, and rock debris. On the slopes and in spaces between the rivers, rockfall-waste and deluvial and solifluction deposits predominate.

The principal feature of the relief in this territory is glacial Lake Tytyl. It fills in the valley of the Tytliutin River, which flows southward from the axial part of the Ilirney Ridge (Northern Anyuy Range). This drainage lake lies at an absolute elevation of 504 m. Its total length is 18.8 km, and it consists of five ponds varying in size and connected by short channels. Its depth in the central part is ca 70 m. The northern portion of the lake, 10.3 km long, is shaped like an oval stretching north-to-south, and its maximum width in the central part is 4.5 km. Off of the western shore, there are several islets, which are remnants of a glacial moraine. Near the estuaries of the Tytliutin and Tytylvaam, 600 – 700-meter wide shoals are observed. In aerial photographs, due to the transparency of the water, alluvial fans and channel deposits, stretching from south-to-north, are clearly visible. In its southern part, the lake narrows markedly due to the presence of promontories, which are the remnants of a frontal moraine 0.8 km wide and 3.0 – 3.5 km long. Along the shore, remnants of low lacustrine terraces have been preserved, attesting to the gradual lowering of the water level. This is also evidenced by the condition of the southern coast of the lake near the waterline, which has shifted downward. On the western coast, remnants of fluvio-glacial terraces at various levels, between 8 – 10 m and 30 – 35 m, have been preserved. The northern coast forms several terraces. Steep, sometimes precipitous slopes, the relative heights of which are 90 – 100 m, alternate with slightly sloping platforms polished by the glacier. South of the lake, the landscape consists of hills and ridges with swamps and lakes filling depressions between them. Oval hills are arranged in chains forming several series of arch-shaped ridges. The largest and most elevated ridge is 15 km in perimeter, and its width is about 3 km. The hilltops are flattened and their relative elevation above the modern river is 100 – 160 m. The lakes situated in the depressions between the hills are 80 – 85 m below the reference level.

The territory displays numerous traces of glacial activity. At high elevations, glacial cirques are present. Most valleys of the northern and southern slopes of the Ilirney Ridge are connected by deep passages partly shaped by the glacier. The valleys are straightened, and their transverse profile is typical of glacial troughs. The valley floors are filled with moraine and fluvio-glacial sediments in frontal moraines. Geological mapping on a 1:200,000 scale in the southern slope of the Ilirney Ridge has revealed two glacial horizons – Anyuy and Ilirney, corresponding to the Zyrianka and Sartan glacials of the Late Pleistocene. South of the area, in the Malyi Anyuy River valley, Middle Pleistocene moraines were discovered. Lake Tytyl resulted from the damming of the Tytliutin River by a huge frontal moraine. The bar apparently marks the maximal expansion of the Sartan glacier. This was a complex valley glacier, about 34 km long, consisting of several valley glaciers descending along the Tytliutin, Tytylvaam, and Lukovaya river valleys At higher elevations, the valleys connected these glaciers with those moving north The maximal expansion of Sartan glaciers, according to the radiocarbon chronology, occurred 17 – 20 ka ago (Glushkova, Gualtieri, 1998). Later, gradual degradation began. Thawing of the glaciers, here as elsewhere, passed through several stages. In certain valleys of the Ilirney Ridge (those which are situated at maximal altitudes), glaciers existed throughout most of the Holocene. In the valleys, glacial landforms such as remnants of aquatic-glacial terraces and outwash plains predominate. Of the moraines, which usually cover the valley floors, only narrow strips near the foothills have been preserved at 20 – 35 m above the water level. Wherever the slopes are steep, these remains are usually covered with screes, and in the stream valleys they are deformed by modern alluvial fans.

One of the major features of the landscape in the Tytylvaam River valley is the Krasnaya aufeis, 3.6 km in length. On the right bank, the ice is so thick that it does not thaw out in summer, and a large, round massif of ice, about 2 sq. km in area and incised by deep fissures, remains until the end of the season. In its central part, two round buttes, several meters high, protrude above the surface of the ice field. Most of the aufeis thaws out by the end of the summer, and in its place, on the valley floor, typical minor surface landforms emerge, with numerous small transitory streams skirting round the frozen part of the aufeis. Thawing exposes fields of light boulder shingle beds devoid of vegetation or lichens. The ice field actively truncates the valley slopes and smoothes them. Intense erosive action is mainly visible along the right side of the valley. Like most other aufeises, this one has originated from the freezing of the cross section of river channel during the winter when channel and subterranean waters flow onto the surface. Thawing begins when the temperatures are regularly above zero. Like other ice fields, Krasnaya is a result of the activity of Sartan and Holocene glaciers.

Toward the estuary, the bed of the Tytylvaam River shifts toward the left side of the valley, where remnants of the floodplain, 1.5 – 2.0 m high, of the first fluvial terrace above it, 3 – 4 m high, and of the fluvio-glacial terrace 8 – 10 m high are visible. Under the slope, the Sartan moraine, partly overlaid by screes, has been preserved. The river forms gentle meanders and divides into several shallow arms. The left-bank floodplain within the study area merges with the alluvial fan. Its microrelief is uneven, with numerous swampy or dried-up remnants of former channels. Once every few years this part of the valley is submerged by the spring floods. Both on the right and left banks, the surface of the fluvial terrace above floodplain is covered by small elongate lakes. This terrace is being actively truncated by the river and forms a more than 2-km long escarpment.

The gradual and very considerable warming that occurred at the end of the Late Pleistocene and in the Early Holocene caused the melting of major glaciers in the valleys. The routes of prehistoric hunters coincided with those of the numerous animals that followed the retreating glaciers. Apparently, in the Early Holocene, a passage emerged between the Tytylvaam River valley on the southern slope of the Ilirney Ridge and the Burlivaya River on its northern slope. Along this passage, situated at an elevation of only 900 m, herds of deer and possibly the last generations of mammoth were moving during summertime. Animals that migrated to the relatively warm Malyi Anyuy River valley for the winter period began to move north to the Chaun

Plain and further away to the East Siberian Sea coast during the spring snowmelt. Prehistoric humans traveled along the Tytylvaam and Tytliutin rivers. The presence of campsites in this place is not accidental since the large nearby lake abounds in fish. Also, the large ice field attracted animals in summer by offering protection from gnats, and in spring by providing sources of salt. Finally, the precipitous southwestern slope of the Krasnaya River was frequented by bighorn sheep, which provided an additional source of food for humans. Prehistoric hunters settled on the smooth, dry, and relatively well drained surface of the fluvio-glacial terrace. At present, due to the deep freezing of the sediments comprising the terrace, only a small portion of its remnants have been preserved. The principal part was eroded by the river, forming a 3 – 4-meter high alluvial terrace.

Traces of human activities during various periods of the Holocene can be traced on both sides of the Tytylvaam valley. We will first address the earliest sites, concentrating on the left bank, near the estuary.

Archaeological sites in the Tytylvaam River valley

The sites named Tytylvaam II, Tytylvaam IV locus 1, and Tytylvaam V are situated on remnants of 8 – 10-meter high fluvio-glacial terraces. Tytylvaam IV locus 2 and Tytylvaam III loci 1 – 3 are situated on the 4 – 6-meter high fluvial terrace above the floodplain. Podgornaya is situated on the more than 20-meter high side moraine (see Fig. 2).

Tytylvaam II

At Tytylvaam II, the northwestern edge of an eroding bar, which is composed of large cobbles and blocks, was cleared.

The surface is partly covered with turf 1 – 5 cm thick. In several places, the rocks comprising the bar are exposed, and there are many artifacts around them. The cultural horizon of brown humified clay sand extends to a depth of between 12 and 19 – 20 cm.

At the same time, a 4-meter long ledge along the southern border of the site was cleared. The artifacts from this place are indistinguishable from those discovered on the bar, and from random finds, in terms of raw material, technology, and typology.

Artifacts include cores and core preforms, blades, bifaces, cutting tools, and notched-denticulate pieces (possibly saws or *racloirs*), and make up about 5% of the entire assemblage, which consists mostly of waste (nodules, spalls, debris, and flakes).

Cores (n=5). A single-platform core (14.5 × 11.7 × 9 cm) was made on a large pebble. The striking platform, oval in shape and situated perpendicular to the long axis of the core, was prepared by detaching large flakes of variable size. The lateral faces with elongate flake scars converge at a blunt angle, forming a slightly convex shape. Where one of the lateral faces meets the flaking surface (dorsal face), an arching crest, partly extending to the base of the core, was formed by shallow percussion. The slightly convex flaking surface with part of the cortex preserved suggests that blades were detached in a parallel fashion (Fig. 3, *1*).

The second single-platform core (9.3 × 8.9 × 5.6 cm) was made of the same raw material (silicified chunk, possibly a pebble). A straight platform, situated perpendicular to the long axis of the core, was prepared by detaching blade-flakes. The slightly convex working surface displays parallel blade scars at an angle to the long axis. On the edge of the striking platform, traces of trimming are visible on the flaking area. The lateral faces exhibit flaking scars, with vertical crests delimiting the flaking area. On the border between one of these sides and the ventral face of the core, there are complex facets of bifacial trimming, forming a concavo-convex crest. On the border between the other lateral face and the ventral face, this crest is formed incompletely (from the middle to the base of the core). The ventral side of the core is flattened by the detachment of wide blade-flakes (Fig. 3, *5*).

A subprismatic core (8.7 × 4.5 × 5 cm) rectangular in plan and square in profile, with a platform prepared by blade removals and working surface with protruding crest demonstrates scars of opposed-platform unifacial blade flaking. The ventral surface and one lateral face retain some cortex (Fig. 3, *4*).

The assemblage also includes secondary cores fashioned on flakes and blades. A narrow-face flake core (5.4 × 2.5 × 0.9 cm) of a rectangular shape was made on a slightly concave blade-flake (Fig. 4, *3*). It demonstrates two faceted pressure platforms, beveled to the flat face; one of them is perpendicular to the microblade flaking surface (narrow face), while another one joins it at an acute angle and forms a wedge-shaped base. A convex-notched crest is present on the other narrow face of the core. This crest is fashioned by stepped retouch along the edge of a lateral margin preserving the original surface of the flake. Another specimen, a transverse microcore (5.1 × 4.4 × 2.2 cm), was made on an angular wedge-shaped flake of a silicified slate (Fig. 4, *10*) Microblades were detached from unprepared pressure platform; the working face is slightly convex. A flake without evidence of secondary treatment demonstrates traits

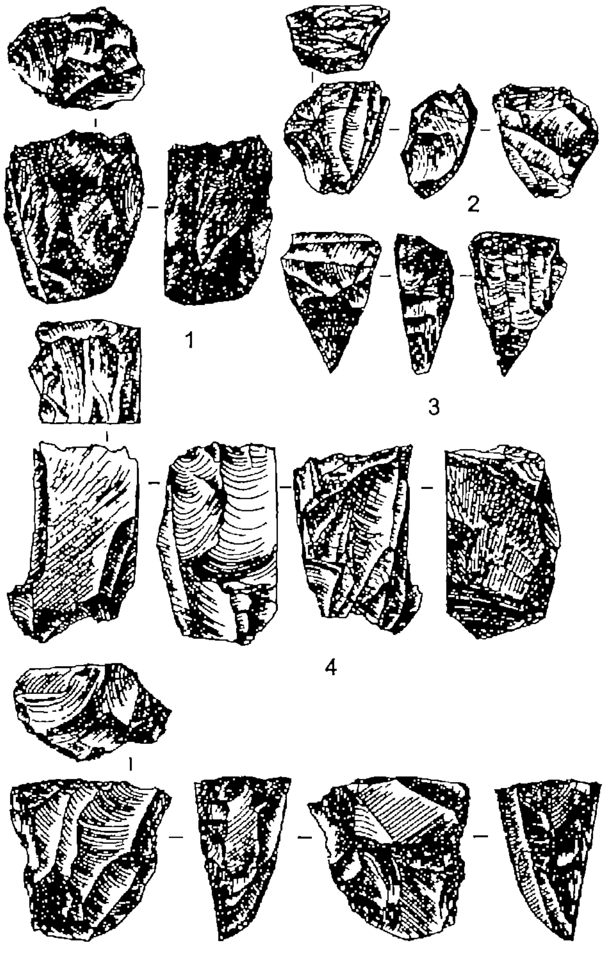

Fig. 3 Cores.
1, 4, 5 – from Tytylvaam II, *2, 3* – from Tytylvaam IV, locus 1

characteristic of wedge-shaped cores (lateral margins, crest on the back and base of the core). The narrow end of a blade (4.5 × 2.5 × 1.5 cm), with an unprepared platform, exhibits two microblade removal scars.

The assemblage includes a series of nodules (n=8) oval and subtriangular in shape and subcuboid in plan. These artifacts show traces of expedient working, scars of single blade removals, and partially preserved cortex. The dimensions of the three nodules range from 8 × 5.5 × 4.8 cm to 4.3 × 4.5 × 3.9 cm; the others are within the range of 11 × 6.8 × 4.4 cm and 10.3 × 6 × 4.8 cm (see Fig. 4, *1*).

Microblades are absent from the collection The assemblage is dominated by large blade blanks (Fig. 4, *7*, 5, *1*) and blades (Fig. 4, *6*, *8*, *9*); the latter are mostly short, though some large specimens (12.2 × 6 × 3.1 cm; 11.9 × 4.8 × 2.3 cm) are also present.

Two cutting implements made from parallelogram-shaped tabular blanks were recovered. One of them exhibits a working edge fashioned by marginal retouch on both sides (Fig. 5, *2*); the working edge of the other one was produced with fine retouch on one side.

Scraper-like tools were mostly produced on flakes (Fig 4, *2*, *13*) One *racloir* was fashioned on an oval spall, sub-triangular in cross-section and with a large bulb of percussion; its working edge was trimmed with fine serrated retouch (Fig. 5, *3*). The assemblage comprises combination tools: e.g., on a large amorphous flake (8.5 × 6 × 3 cm), a concave working edge of a *racloir* (an adze (?)) was produced through percussion; nearby, on a small prominence, a micro-*grattoir* blade (0.6 × 0.4 cm) was fashioned by fine retouching.

Bifaces are represented by two specimens: a crudely fashioned blank (?) and a fragment of a thin implement (Fig. 4, *5*, *12*).

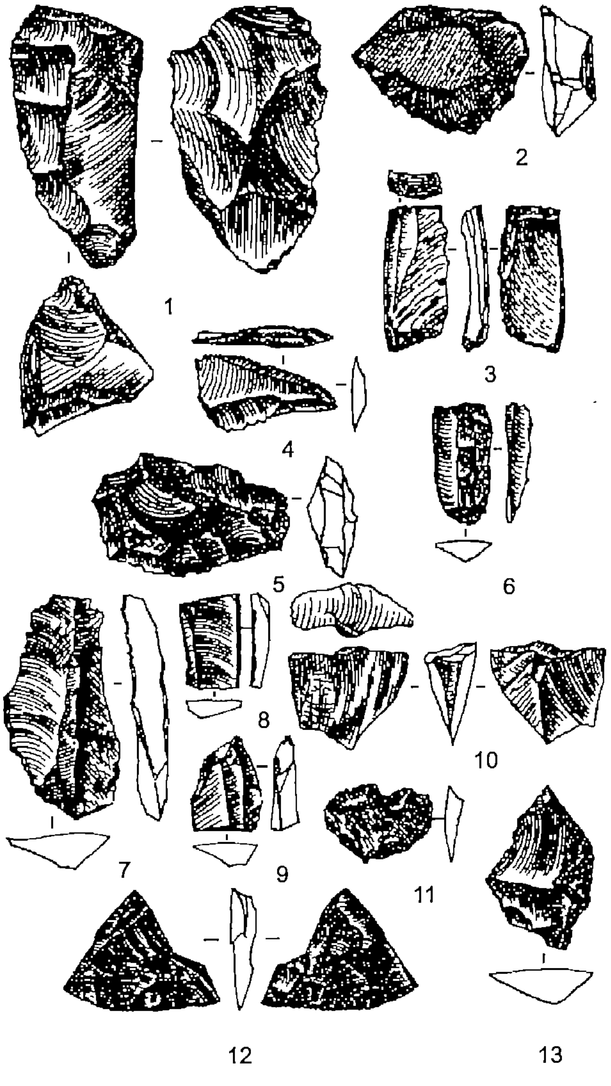

Fig 4. Lithic artifacts from Tytylvaam II
1 – core preform; *2* – denticulate; *3, 10* – narrow-face flake cores; *4, 6 – 9, 11, 13* – flakes and blades with use-wear; *5, 12* – bifaces

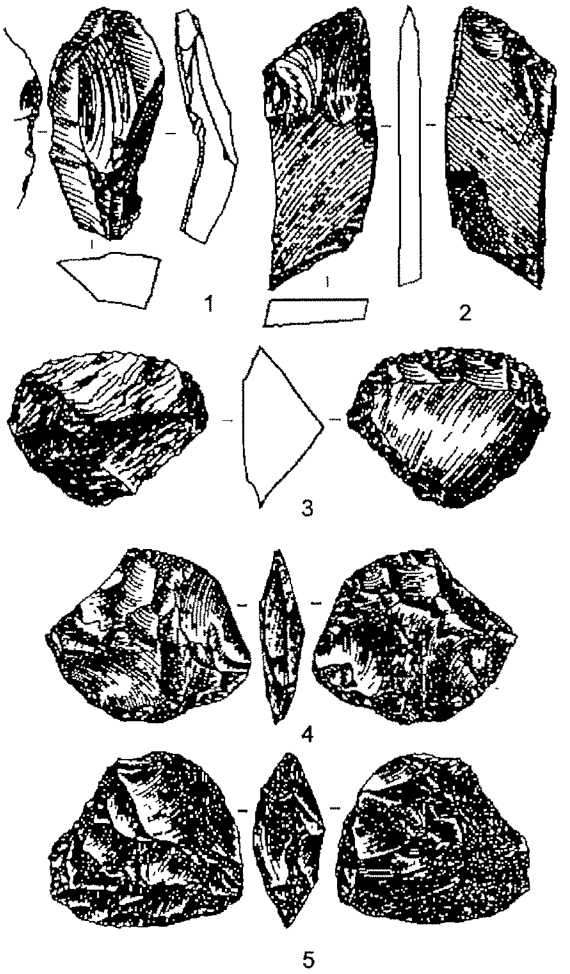

Fig 5 Lithic artifacts from Tytylvaam II (*1 – 3*)
and Tytylvaam IV, locus 1 (*4, 5*)
1 – notch, *2* – cutting tool, *3* – *racloir*,
4, 5 – discoid implements.

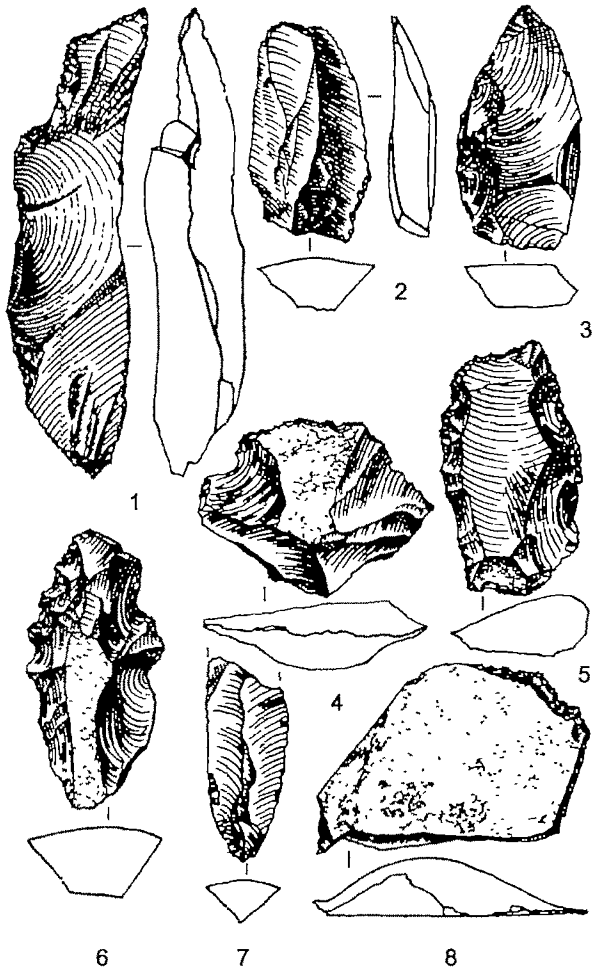

Fig. 6. Lithic artifacts from Tytylvaam II (*6*)
and Tytylvaam IV, locus 1 (*1 – 5, 7, 8*).
1 – cutting tool (knife (?)), *2* – *grattoir*, *3* – retouched point (?),
4 – denticulate; *5, 6, 8* – notched-denticulate tools, *7* – blade.

A tool (possibly a saw-insert) displays a notched-denticulate working edge along half of the implement's perimeter (Fig 6, *6*).

The debitage includes a large portion of expedient, single-use implements. Blades as well as blade, cortex and amorphous flakes retain traces of use-wear (Fig. 4, *6 – 9, 13*).

Tytylvaam III, loci 2 and 3

Archaeological remains were collected from the sand surface underlying the turf. This sand lens is part of a 400 – 500-meter long terrace, which is 5 – 6 m high and stretches along the left side of the Tytylvaam River valley.

The lithic assemblage comprises a prepared core, two cores, a *grattoir*, and three blade-flakes. The artifacts were made of tuffite and silicified flat slate.

The prepared core is wedge-shaped with a beveled platform and crudely worked lateral margins forming a zigzag crest. The base of this specimen was prepared in the form of a small wedge-shaped protrusion; the flaking face contains the scar of a single blade removal (Fig. 7, *5*).

The narrow-face flake core exhibits a slightly beveled platform and straight flaking face with three blade removal scars. The ventral surface is flat and the base is oval (Fig. 8, *1*).

The other narrow-face flake core was produced on a flake. Its plain platform was prepared by the removal of a single spall. The base of the core retains the sharp edge of the original flake. The flaking surface is convex. A pressure platform for the detachment of blades was prepared by trimming. The crest on the ventral surface shows scalar retouch (Fig. 8, *6*).

An end-scraper was fashioned on the distal segment of a thick blade (Fig. 8, *2*). Flakes were

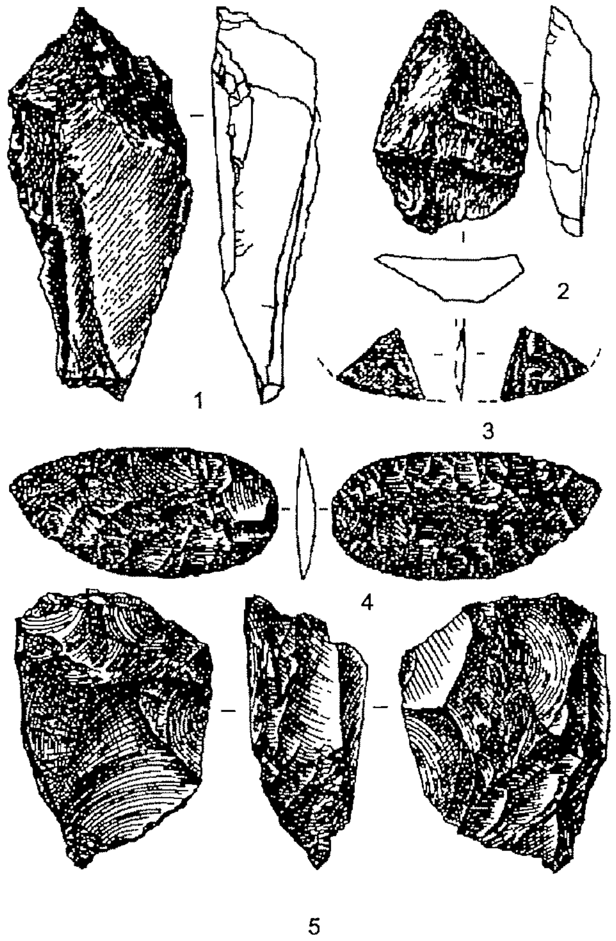

Fig 7. Lithic artifacts from Podgornaya (*1 – 4*) and Tytylvaam III, locus 2 (*5*)
1, 2 – beak-shaped implements, *3, 4* – bifaces;
5 – core preform.

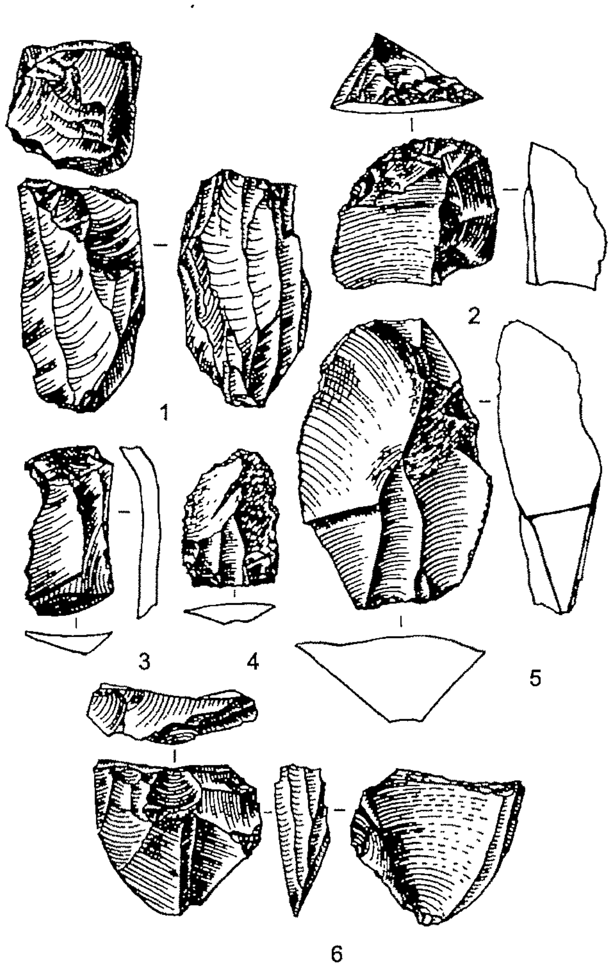

Fig. 8 Lithic artifacts from Tytylvaam III, locus 2.
1 – core, *2* – *grattoir*; *3 – 5* – blade-flakes with use-wear,
6 – narrow-face flake core.

probably used as expedient single-use tools, as evidenced by removal scars and irregular retouch (Fig. 8, *3 – 5*).

Podgornaya

Artifacts were collected from the moraine and from the gentle slope (the left side of the trough valley) over 30 m above the surface of the water.

A tool with a protruding beak-shaped margin was produced on a thick spall. Its base (a shaft) is narrow and flat (see Fig. 7, *1*). A large *éclat débordant* was modified into a *racloir* (?) with a V-shaped working edge (see Fig. 7, *2*).

A thin bifacial foliate with good preservation demonstrates two completely retouched faces. Traces of fine marginal trimming are visible along the whole perimeter of the tool (see Fig. 7, *4*). A fragment of an analogous implement is also present in the collection (see Fig. 7, *3*).

Tytylvaam IV

Topographically, the site is subdivided into locus 1, situated on a 7 – 8-meter high fluvio-glacial terrace truncated by the Tytylvaam River, and locus 2, situated on the 4 – 5-meter high fluvial terrace bordering the river on the southwest. During the reconnaissance of locus 1, about 1,000 artifacts were collected, less than 2% of which are identifiable forms such as *racloirs*, cutting tools, and fragments of bifaces. The remaining part is made up of debris, fragments of blanks, angular spalls, nodules, and flakes (including 28 scales). The raw materials were tuffite and silicified slate.

The terrace is covered by a thin layer of turf, with exposed pieces of large pebbles, boulders, and flake concentrations. The northern edge of the terrace is completely exposed and crumbles toward the river. Turf clearing began in this section, revealing the following order of layers: turf (2 – 5 cm),

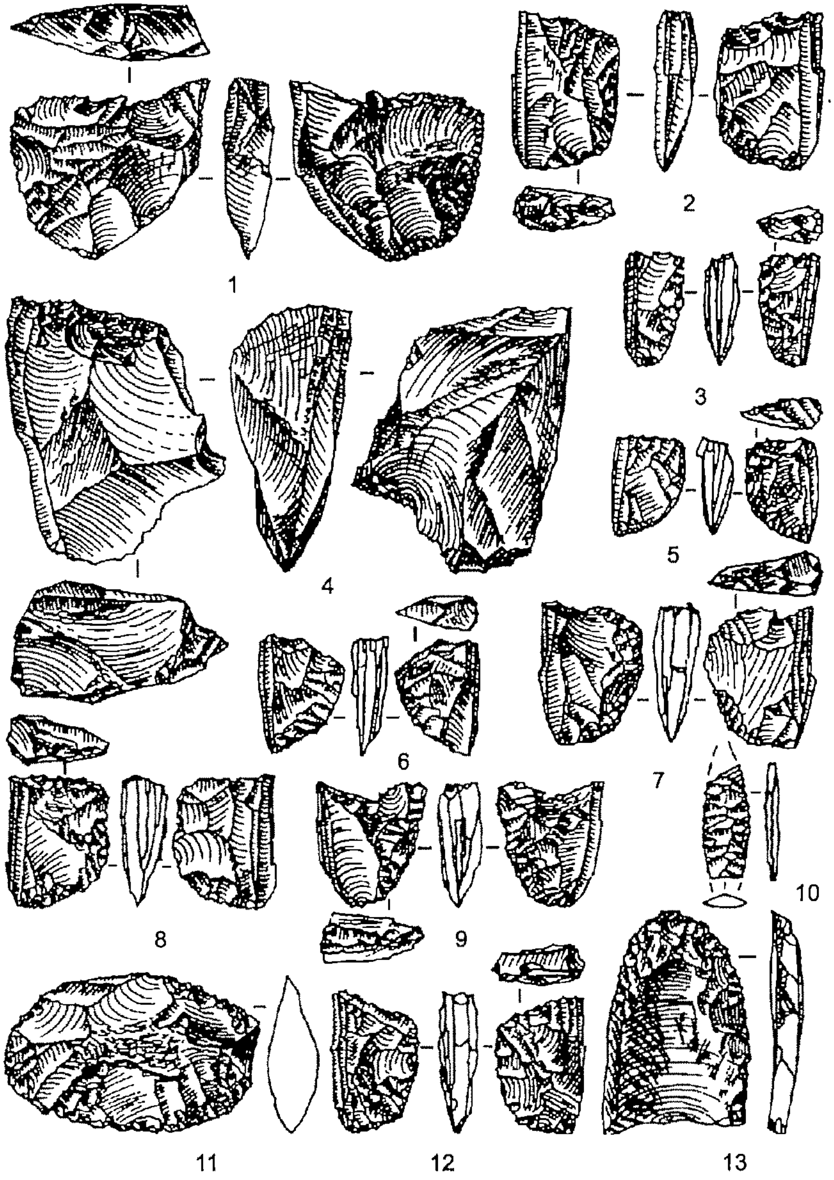

Fig. 9 Lithic artifacts from Tytylvaam IV
1, 4, 5, 11, 13 – from locus 1, *2, 3, 6 – 10, 12* – from locus 2 *1, 4* – preforms, *2, 3 – 9, 12* – wedge-shaped cores, *10* – fragment of a point; *11* – biface; *13* – *grattoir*

humified loamy sand with gravel (4 cm and less), and a dense shingle bed composed of irregular pebbles, sand and gravel forming the fluvio-glacial terrace.

On the cleared 20 sq. m area, large pebbles were exposed. Their arrangement suggests that they belonged to a surface dwelling possibly similar to the summer structures of northern peoples. The artifacts were mostly concentrated around a large flat boulder Near the boulder, there was a shallow pit 15 – 18 cm deep (diameter, 35 – 40 cm), filled with artifacts. The lithic assemblage comprised two core performs (one is wedge-shaped and the other one is for a narrow-face flake core, Fig. 9, *1, 4*), a biface (Fig. 9, *11*), an end-scraper fashioned on a blade (Fig. 9, *13*), and sixty-nine large flakes. At the very bottom of the pit, several pieces of charcoal were found and removed for radiocarbon analysis.

In the process of the site clearing, 329 artifacts were recovered: two cores, a core perform, a nodule, four blades, two discoid bifaces, two bifacial points, two implements with serrated working edges, a cutting tool or a knife, and a burin on a flake; the rest were debitage products.

Primary reduction is represented by two blade cores demonstrating parallel flaking – one of them has two platforms (see Fig. 3, *2*) and the other is orthogonal (see Fig. 3, *3*) – and by wedge-shaped microcores (see Fig. 9, *1*, *5*).

The tool kit includes two distinct discoid bifaces (see Fig. 5, *4*, *5*) of indeterminate function. Among the recovered bifacial tools, a spearhead (14.5 × 5.5 × 2.5 cm) with a notched base and massive wings with serrated edges is particularly impressive

A cutting tool (or a knife) was produced on a distal end of a blade (see Fig. 6, *1*). The triangular working edge was fashioned with fine retouch; the long axis shows no traces of working; retouching is visible only on a portion of its left edge.

Undulating working edges of scraper-like tools on blades and flakes display fine, serrated retouch (see Fig. 6, *2*, *5*, *8*). Judging from signs of use-wear, debitage pieces such as flakes (see Fig 6, *3*, *4*), blades (see Fig 6, *7*), and miscellaneous spalls were used as tools.

The artifact assemblage of Tytylvaam IV, locus 1, inclusive of surface finds, makes it possible to provisionally identify the locality as a workshop site where primary raw material exploitation took place. This presupposition is supported by the abundant debitage, characterized by a negligible proportion of waste resulting from tool-making; tools also form only a small percentage of lithic artifacts.

Upon the examination of the 4 – 5-meter terrace of Tytylvaam IV, locus 2, a wedge-shaped core (see Fig. 9, *9*), an elongate (ski-shaped) spall, and several microblades were collected from eroded surfaces. Small concentrations of microchips were recorded there. At one of the concentrations, a test pit (2 × 2 m) was dug; in 2002 excavations expanded from this test pit to cover a 27 sq. m area. The following stratigraphic sequence was revealed:

turf, 2 – 14 cm

fine sandy loam of ashy color, 1 – 5 cm

brown sandy clay loam with black and brown humus intrusions, 13 – 27 cm

yellowish brown sterile sand, 5 – 18 cm

dense sterile sandy loam of bright yellow color.

In the northern portion of the excavatied area, on the walls and on the floor, a frost crack and an intrusion of ashy-colored fine sandy loam penetrating to a depth of 20 – 23 cm were recorded. A concentration of artifacts scattered along the whole extension of the intrusion was found. In the southern portion of the excavated area, contours of a hollow (a pit (?)) filled with black and brown humus were revealed. The majority of the artifacts found in 2002 were recovered in this hollow.

The artifacts were embedded into the brown humic sediment; the thickness of this culture-bearing unit varied from 15 to 37 cm. Some lithic specimens lay in vertical or reclinate position. The collection comprises 649 artifacts: wedge-shaped cores (n=26), bifacial core performs (n=2), spalls resulting from the rejuvenation of core crest-shaped platforms (n=3), microblades (n=56), crested blades (n=2), end-scrapers on blades (n=3), burins on flakes (n=10), fragments of arrowheads (n=2), a borer, choppers (n=2), *éclats débordants* (n=2), chunks of raw material (n=2), nodules (n=3), flakes (n=196), and microflakes (n=337).

The artifacts were made of tuffite and silicified slate of mostly gray and occasionally greenish colors. Several spalls were detached from basalt pebbles.

Some of the wedge-shaped cores demonstrate a distinct or faint crest on the pressure platform (see Fig. 9, *3*, *7*, *8*). This crest was removed by trimming during the process of platform surface preparation for microblade pressure flaking. On some cores, the whole pressure platform was trimmed by shifting towards a lateral margin (see Fig. 9, *2*, *12*); in some cases, a portion of the crest of the keel was flaked (see Fig. 9, *6*).

The artifact assemblage from Tytylvaam IV, locus 2, illustrates the complete process of microblade production based on wedge-shaped cores. Numerous artifacts collected from the both loci as well as surface finds permit the reconstruction of the technological sequence: biface – primary (flaked) blank – preform with the prepared pressure platform – perform with the treated platform and indicated flaking surface (removed crest) – cores with scars of one, three, or at most five microblade removals. This sequence is illustrated by thirty-six items, including three bifaces, three halves of bifaces, two preforms, and twenty-eight cores. This artifact assemblage, collected in 1998 – 2002, illustrates all the stages of the wedge-shaped core reduction: from the primary flaking of a biface to the final stage of the core utilization, when it was discarded or modified into a burin by detaching one or two burin spalls from the wedge-shaped base. In this lithic industry, thin bifaces of oval and, possibly, subdiscoid shapes were often produced. They were flaked or dissected along the transverse axis As a result, contours of the future pressure platform were indistinct. The platforms, judging by the core performs and rejuvenation spalls (n=3), could be straight, concave or convex ("humped"). The last is derived from a step fracture with a protrusion on the flaked biface. This protrusion was not removed, but rather retouched. These technological elements were recorded not only in the lithic

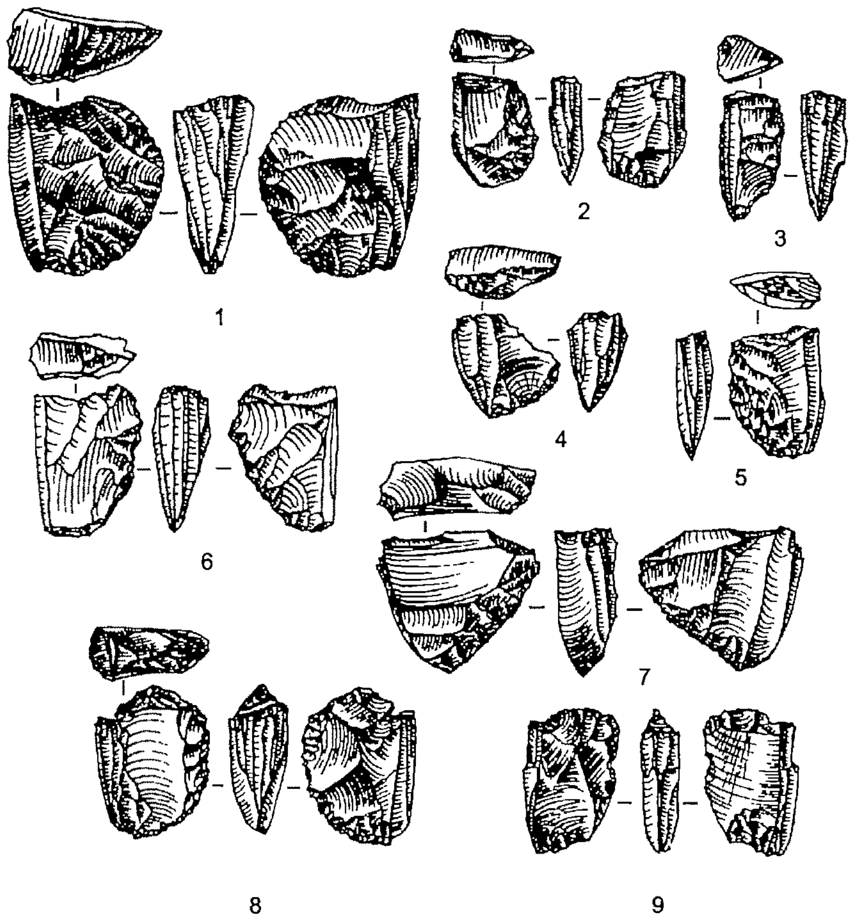

Fig 10 Wedge-shaped cores from Ushki I (*1, 5, 6*) and Ushki V (*2 – 4, 7 – 9*), Kamchatka.

industries from the Tytylvaam River valley (see Fig. 9), but also in assemblages from Ushki I and V on Kamchatka Peninsula (Fig. 10, *1, 5, 6, 8, 9*).

Functionally, the Tytylvaam IV locality might probably be identified as a workshop site oriented toward the production of microcores.

Discussion

Our analysis suggests that the Chukotka sites (Tytylvaam II – V and Podgornaya) represent one and the same culture. The earliest Holocene populations associated with it inhabited valleys of polar Chukotka previously occupied by glaciers. Assemblages from excavations, turf clearings, and surface collections are homogeneous in terms of technology, typology, and raw materials, and contain no diagnostic artifacts of a later period.

Materials from the first excavations in the Tytylvaam River valley offer some possibility for the reconstruction (only a tentative one, given the mobility of prehistoric populations and the chronological factor) of the Tytylvaam cultural tradition. The assemblages studied attest to the coexistence of three technological components, based on blades, microblades, and bifaces, respectively The blade component is based on the reduction of large prismatic, subprismatic, and orthogonal parallel cores (see Fig. 3; 8, *1*). The microblade component is based on wedge-shaped (see Fig. 9) and narrow-faced (see Fig. 4, *3*, *10*; 8, *6*) microcores. These complexes demonstrate the sophistication of the bifacial technique (see Fig. 4, *5*, *12*; 5, *4*, *5*; 7, *3*, *4*; 9, *10*, *11*).

The largest group of tools (n=10) includes angle and straight dihedral burins on flakes.

Scraper-like forms, too, are numerous, and include end-scrapers on massive blades (see Fig. 6, *2*; 8, *2*; 9, *13*), *grattoirs* on flakes (see Fig. 6, *5*, *8*), and *racloirs* (see Fig. 4, *2*; 5, *3*).

Cutting tools are represented by three massive specimens with oblique retouched edges (see

Fig. 5, *2*; 6, *1*). The collection includes ten angle and straight dihedral burins on flakes. Bifaces were evidently used as knives (see Fig. 4, *12*; 7, *3*, *4*).

Bifacial technique was also employed for the manufacture of projectiles: a fragment of a spearhead, an intact spearhead, and two fragments of arrowheads (see Fig. 9, *10*).

Retouched flakes were apparently used as expedient tools (see Fig. 4, *4*, *7*, 6, *4*; 8, *3* – *5*). Notched tools are quite few (see Fig. 4, *10*; 5, *1*).

Notched-denticulate tools comprise a very distinct group (Fig. 4, *2*; 6, *5*, *6*, *8*).

The collection from Tytylvaam IV includes two choppers

It was impossible, in this brief description, to present a complete picture of the Tytylvaam industries (materials from the 2002 excavations are currently being processed). One noteworthy feature is specific to the microblade technique of Tytylvaam IV loci 1 and 2. The pressure flaking platform of wedge-shaped cores was formed by a retouch that resulted in a crest, and pressure flaking was performed by abrupt hewing directed from the flaking surface at a right or acute angle with the long axis of the core. As a result, at some stage of core reduction, the platform became concave, with the concavity facing the base (see Fig. 9, *1*, *7*, *9*). Apparently, in some cases, the preform was intentionally prepared in such a way that a concave comb-like platform formed an acute angle with the crest on the ventral (back) surface with which it was connected (see Fig. 9, *9*) This technique is well illustrated by a wedge-shaped core from which only a few microblades have been detached (Lake Elgygytgyn, Central Chukotka, collection of the Northwestern Institute in Magadan), and by a flaking scar left by the reshaping of the comb-like platform of the single wedge-shaped core found at Bolshoi Elgakhcha (Kiryak, 1996a: fig. 4, *11*, *t*). The inhabitants of Tytylvaam manufactured wedge-shaped cores and possibly narrow-faced ones, not only on bifaces, but also on blanks other than microcores (see Fig. 7, *5*; 9, *4*).

In order to determine the place of the Tytylvaam assemblages among other Paleolithic cultures of the adjacent territories, we must compare them with finds from sites with well-defined stratigraphy. The closest parallels are provided by the Diuktay Culture of Yakutia. They concern primary reduction techniques. The Diuktay assemblages, notably the early ones from Ezhantsy, include, apart from wedge-shaped cores, a considerable number of subprismatic and prismatic ones, made on large river pebbles. The combination of wedge-shaped and prismatic cores is also typical of the Tytylvaam assemblages. Certain wedge-shaped cores from Yakutia (those made on unifacial blanks) display a crest on the ventral surface (cf. Fig. 9, *4* and (Mochanov, 1977: plates 1, *10*; 4, *2*, *8*; 8, *7*; 21a, *1*)).

The distinguishing feature of the Tytylvaam cores is the presence of pressure platforms prepared by retouch (the platform is sometimes inclined toward one of the lateral margins). Also typical is the comb-shaped crest which, in the course of core reduction, was removed by the detachment of short flakes parallel to the long axis; the shape of the platform depended on the flaking angle and was sometimes concave (see Fig. 9, *1*, *7*, *9*). Similar features are seen in the Diuktay assemblages (cf. (Ibid.: 70; plates 15, *12*, *16*; 23, *2* – *7*; 24, *37*)), although they are not mentioned by Mochanov. There are some differences as well. Specifically, all the Tytylvaam wedge-shaped cores are carinated, whereas in Diuktay, apart from these, numerous horizontal cores of the Gobi type are present (Ibid.: plates 8, 21a, 23).

Similarities are also observed in the principal categories of tools. The Diuktay assemblages include burins of various types (angle, side, straight dihedral, and transverse) on flakes and on fragments of tablets. Burin edges were shaped by one or two burin spalls, and their bodies were either partly retouched or unmodified. In Tytylvaam, angle and straight dihedral burins (n=10) are identical to those from Diuktay in terms of technique.

The bifaces, too, are similar (cf. Fig. 5, *4*, *5*; 9, *11* and (Iibid.: plates 3, *2*; 13, *20*; 22, *11*)).

The Diuktay assemblage includes foliate projectile points (Ibid.: plates 3, *1*; 7, *7*). Fragments of two such points were found at Tytylvaam IV locus 2 (see Fig 9, *10*).

Mochanov (Ibid.: 239) believes that the Diuktay Culture disappeared ca 11 – 10 5 ka BP. However, as the above parallels imply, the tradition continued to exist in adjacent western Chukotka during the earliest stages of the Holocene.

Mochanov (Ibid.: 224) supposes that certain artifacts from Late Pleistocene layer VI at Ushki I, Kamchatka, may be classified with the Diuktay Culture. Dikov (1979: 72), in turn, suggested that the Late Paleolithic culture of Ushki might have been genetically related to Diuktay. Indeed, the culture represented by layer VI at Ushki I, V and VI is basically similar to Diuktay. The Ushki Culture, too, reveals the coexistence of two traditions, one based on blades, another one on microblades. Apart from crude subprismatic cores, people of Ushki used microcores, which predominate in all Ushki assemblages. The types of microcores are virtually identical to those in Diuktay (Ibid.: fig. 16). Burins, bifaces, and arrowheads are similar (Ibid.: fig. 18 – 20) Crude cutting and scraping tools made on pebbles and tablets are rather numerous (Ibid : fig. 17, 18). The Ushki assemblages, however, include stone objects such as *labrets*, sculptures, carved stones, and pendants, which are not represented in Diuktai. Also, the Ushki people built sophisticated constructions such as semi-underground dwellings with corridor-like exits and stone hearths, which find no parallels either in Diuktay or in any other Upper Paleolithic cultures of Siberia.

A peculiar feature shared by the Tytylvaam artifacts and those from Ushki layer VI is the presence, in some specimens, of a comb-like retouched crest on the pressure platforms (see Fig. 10, showing not only finds from Ushki I, excavated by Dikov, who was able to publish only a small portion of the Ushki materials, but also new ones, excavated by us at Ushki V during the 2000 field season). Dikov himself noted the peculiarity of this type (or subtype) of wedge-shaped cores in his description of the scarce materials from the final Upper Paleolithic layer V of Ushki, where artifacts typical of layer VI were registered as well (Ibid.: 78). The same type of wedge-shaped core with a comb-like pressure platform prepared by linear flaking for the detachment of microblades is observed on certain cores from Hutouliang, China, situated southwest of Beijing (Chen Chun, Wang Xiang-Qian, 1989: fig. 18: *3*, *6*, *7*). The assemblage from Hutouliang includes foliate bifaces, spearheads, and end-scrapers similar to those from Ushki I and V layer VI (Ibid.: fig. 18, *8* – *11*). The site was dated to 11 ka BP (Ibid.).

The peculiar feature of wedge-shaped cores, which was described above, is also found in materials from Alaska. The assemblage of Teklanika West includes artifacts that are typologically close to those from Tytylvaam. Among these are not only wedge-shaped cores with retouched pressure platforms (sometimes concave) with crests (West, 1996: fig. 7, *3*, *n* – *r*), but also large subprismatic cores (Ibid.: fig. 7, *3*, *f*, *g*), end-scrapers on sections of massive blades (Ibid.: fig. 4, *3*, *g*), and transverse end-scrapers on large flakes (Ibid.: fig. 4, *3*, *f*). In Dry Creek component II, which is apparently contemporaneous with Ushki layer VI, the separation of a comb-shaped slightly concave pressure platform and its reshaping by linear flaking is clearly visible (Hoffecker, Powers, Bigelow, 1996: fig. 7, *9*, *b*, *c*, *g*). It is also characteristic of the Campus site, the age of which is not clear (Slobodin, 2001). Dikov (1979: 11), who pointed to the affinities between cultures of Arctic and sub-Arctic America and Ushki layer VI, specified the North American sites exhibiting such ties: Denali Ridge, Teklanika, Hilly Lake, and Campus. His broad chronological estimate for these sites was 13th – 8th millennia BC (Dikov, 1979: 71).

A noteworthy feature of the Tytylvaam materials is the wide use of the blade technique based on large subprismatic cores mostly made from river pebbles. An archaic characteristic, reminiscent of the Mousterian, is the use of implements with notched-denticulate working edge.

These features are to some extent paralleled by assemblages from Mongolia. This mainly concerns subquadrangular cores (cf. Fig. 3, *5* and (Derevianko et al., 1984c: 34, fig. 148)), bifrontal ones (cf. Fig. 3, *2* and (Derevianko et al., 1984b: 7, fig. 3)), massive core-like narrow-faced blanks (cf. Fig. 9, *4* and (Ibid.: 19, fig. 96; 31, fig. 28)), and unusual subtriangular cores for opposite detachment of blades from opposite sides (cf. Fig. 3, *3* and (Derevianko et al., 1984a: 33, fig. 6)).

Quite numerous among the Mongolian finds are *racloirs* with denticulate (Ibid.: 36, fig. 4, 26) or notched-denticulate edges (Ibid.: 39, fig. 15; 58), including notched *racloirs* (Derevianko et al., 1984b: 42, fig. 55, 151). Similar tools are represented in the Tytylvaam assemblages (see Fig. 6, *4* – *6*, *8*).

Other similarities include the use of blades and discoid flakes for manufacturing tools.

These techno-typological parallels cannot be coincidental and are evidently due to common origin. To trace their specific sources, further research is required. So far, the study of Tytylvaam sites has only just begun (the total excavation area equals only 54 sq. m) and must be continued.

Conclusion

The analysis of Upper Paleolithic sites in Chukotka and their comparison with the reference sites in adjacent territories, Yakutia and Kamchatka, brings us to the conclusion that local Late Pleistocene cultures such as Diuktay (35 – 10.5 ka BP) and Late Ushki layer VI (between 10,860 ± 400 and 10,360 ± 345 BP) have a common origin. From this base, the geographically intermediate Early Holocene culture of western Chukotka originated. The Tytylvaam assemblage has been dated to 9725 ± 45 BP (CAMS 80788) and 9820 ± 40 BP (CAMS 80789).

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THE PALEOLITHIC-TO-NEOLITHIC TRANSITION AND THE ORIGIN OF POTTERY PRODUCTION IN THE RUSSIAN FAR EAST: A GEOARCHAEOLOGICAL APPROACH

Introduction

The transition from the Paleolithic to the Neolithic in the southern Far East of Russia (the Amur River basin and Primorye) is one of the key issues in the archaeology of the region. With regard to East Asia, the Neolithic is viewed as a stage marked by the production of pottery (Chard, 1974; Derevianko, Petrin, 1995; Barnes, 1999; Kuzmin, Orlova, 2000). The archaeological study of Neolithic sites in the Russian Far East began in the 1920s and 1930s (Gerasimov, 1928; Okladnikov, 1936, 1980) and continued into the 1950s (Okladnikov, 1958). The most active excavations of Paleolithic and Neolithic sites in this region lasted from the 1960s to the 1990s (Okladnikov, Derevianko, 1973, 1977; Derevianko, Medvedev, 1992a, b, 1993, 1994, 1995; Medvedev, 1995; Lapshina, 1999; Tabarev, 2000; Krupianko, Tabarev, 2001; Garkovik, 1998, 2000; Kononenko, 1996; Kononenko et al., 2001; Shewkomud, 1994, 1998; Shewkomud, Kato, 2002). Environmental and chronological studies concerning the transitional period between the Paleolithic and the Neolithic began in the 1970s (Levintov, 1973, Ivlev et al., 1974; Razrez..., 1978; Okladnikov, Medvedev, 1983; Velizhanin, 1985), and the present author continued intensive research during the late 1980s and 1990s.

By now, abundant new information on geomorphology, stratigraphy, paleogeography, and chronology of the key Final Paleolithic and the earliest Neolithic sites in the southern Far East of Russia is available, making it possible to estimate the time when pottery production originated and to assess the environmental conditions under which this process occurred. The objective of the present article is to integrate the results of the application of science-based methods to materials from sites in the Amur River basin and Primorye, with the aim of reconstructing the environmental and chronological framework for the transition from the Paleolithic to the Neolithic in these regions. This paper utilizes works published as recently as early 2003.

Materials and methods

The geoarchaeological analysis of the Paleolithic to Neolithic transition in the southern Russian Far East is based on key sites in the Amur River basin (Malye Kuruktachi, Goly Mys-4, Gasya, Khummi, Goncharka-1, and Gromatukha), and in Primorye (Suvorovo-4, Ustinovka-3 and 6, and Chernigovka) (Fig. 1). The following science-based methods have been applied: geomorphological, stratigraphic, palynological, and radiocarbon and thermoluminescence dating (Kuzmin, 1994). The most important of these is radiocarbon analysis, with which most of the sites were dated. The principles underlying this method have been outlined in numerous publications (the Russian ones include (Kuptsov, 1986: 197 – 241; Arslanov, 1987; Dergachev, Veksler, 1991; Orlova, 1995)). For dating small (less than 1 g in size) samples of charcoal, of organic temper found in ceramics, and of charred residues on clay vessels, the accelerator mass spectrometry (AMS) method was used (Linick et al., 1989; Donahue, 1995; Tuniz et al., 1998).

The following organic remains from the sites were dated by the radiocarbon method: (1) charcoal from

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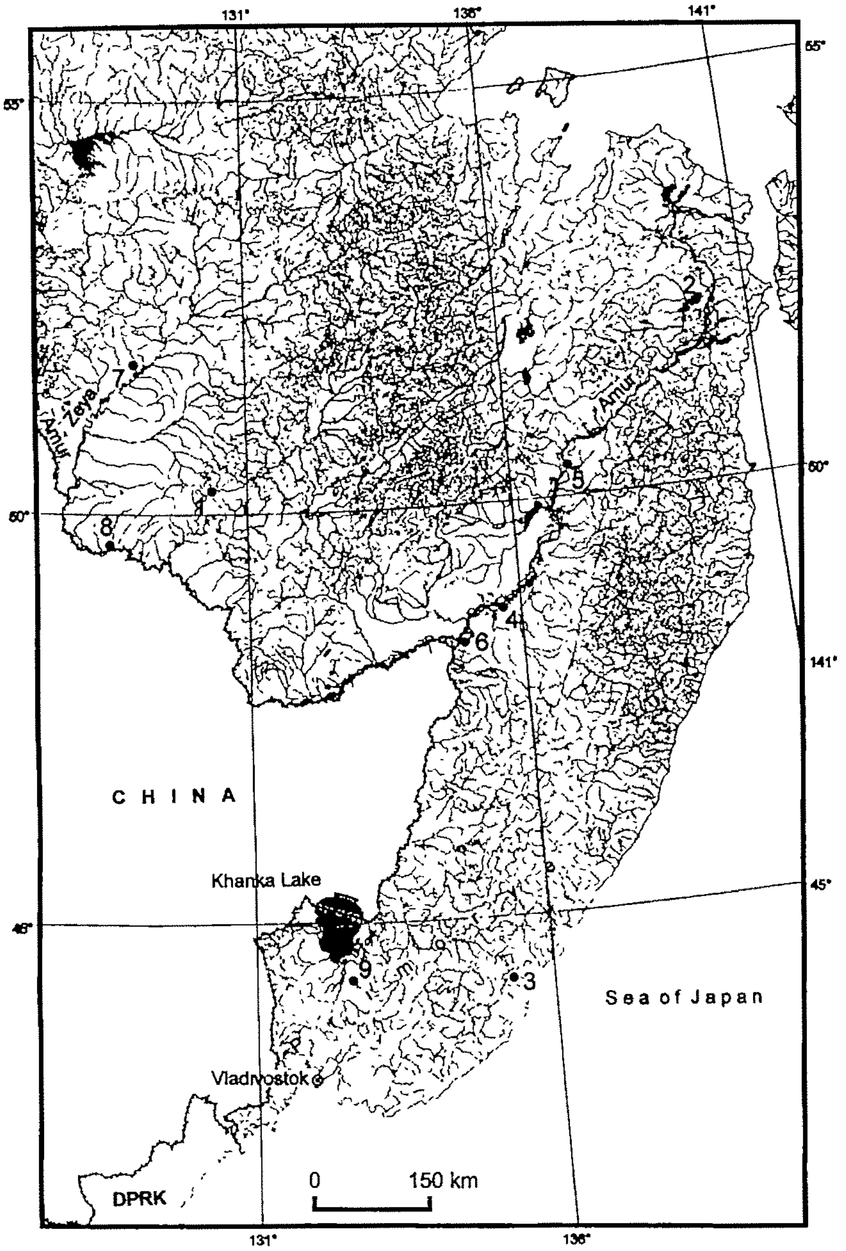

Fig 1. Map showing the location of key sites of the Final Paleolithic and Initial Neolithic in the southern part of the Russian Far East
1 – Malye Kuruktachi, *2* – Goly Mys-4, *3* – Suvorovo-4, Ustinovka-3 and 6, *4* – Gasya, *5* – Khummi; *6* – Goncharka-1; *7* – Gromatukha; *8* – Novopetrovka-2, *9* – Chernigovka

ancient hearths; (2) charcoal scattered in the habitation layer; (3) plant remains which tempered the clay used for making pottery; and (4) charred residues on pottery. This is the first time in the practice of the Russian Far Eastern geoarchaeology that the AMS method was used for dating the latter two categories of remains. Charcoal and charred residues on pottery were dated according to the standard technique (Arslanov, 1987; and others). For assessing the age of the organic temper, a special technique of carbon extraction was used (Jull et al., 1998; O'Malley et al., 1999). It is aimed at extracting carbon primarily from the organic temper, the age of which corresponds to the age of the vessel itself, rather than from the clay paste, where the carbon is usually older. Each sample of ceramics was divided into two parts: the outer, representing mostly clay paste, and the inner, containing clay tempered with organic matter. Both parts were processed using the standard acid-alkali-acid technique, and copper oxide (CuO) and gaseous oxygen (O_2) were used for the preparation of carbon dioxide. Each sample was heated at 400 °C for 1 hour and at 800 °C for 30 minutes without removing it between the heating cycles. After that, another sample was burnt with copper oxide at 1000 °C for 10 minutes.

The reliability of the estimated ^{14}C dates was assessed by comparing them with those for the charcoal from hearths. The results suggest that the carbon of the low-temperature fraction (400 °C), obtained by heating the interior part of the sample, is more suitable for dating the pottery (O'Malley et al., 1999). This is likely because the carbon from this part apparently mostly derives from the temper, with only a minimal proportion from the clay. For an independent control of the ^{14}C dates for the temper, a thermoluminescence date was obtained (Kuzmin et al., 2001).

^{14}C dates were calibrated using CALIB 4.3 software (Stuiver, Reimer, 1993; Stuiver et al., 1998). All possible intervals of the calendar age for dates within two standard deviations were combined and rounded to the nearest ten years (see Table).

To correlate the estimated dates with paleogeographic data, we used data collected in the 1970s – 1980s from Pleistocene and Holocene sites in the Amur River basin and Primorye (Razrez..., 1978; Korotkiy et al., 1980; 1988, 1997)

Results and discussion

Final Paleolithic sites

The best studied site in the Amur region is Malye Kuruktachi, situated in the lower part of the bedrock slope of the Bureya River valley, directly above the upper part of the river plain (Jull et al., 1999; Kuzmin, Chernyuk, 2000). According to pollen data, over the period when the site was occupied, the vegetation changed from forest tundra to light birch and larch forest with some broad-leaved taxa such as oak, elm, and lime. Radiocarbon dates fall between 14,200 – 10,500 BP (see Table) and suggest that the site existed during one of the interstadials of the Late Glacial, most likely the first half of the Kokorevo warming (ca 13,000 – 12,200 or 13,800 – 13,300 BP (Kind, 1974; Zubakov, 1986)) Recently, the analysis of charcoal from hearths at Goly Mys-4 yielded a series of radiocarbon dates ranging from 12,900 to 10,300 BP (see Table). The upper boundary of the Upper Paleolithic in the Amur region can therefore be estimated to be ca 12,000 BP.

In Primorye, the excavated sites dating from the Final Paleolithic are mostly situated in the valleys of the Zerkalnaya (Tadushi), the Ilistaya (Lefu) and the Razdolnaya (Suifun) rivers. They are all located in the lower parts of the riverine bedrock slopes (Kuzmin, 1994). Suvorovo-4 was occupied during the early part of the warming period, ca 16,000 – 15,000 BP, and was surrounded by birch and hazel forest. Ustinovka-6, dated at ca 11,750 – 11,550 BP (see Table), was occupied during the Late Glacial, and the results of paleobotanical studies attest to open birch forests with some broad-leaved and hazel forest taxa (Verkhovskaya, Kundyshev, 1996). Suvorovo-3 and Suvorovo-6, based on pollen evidence (Kuzmin, 1994; Verkhovskaya, 1996; Krupianko, Verkhovskaya, 1996), date from the Late Pleistocene or Early Holocene, ca 10,000 – 8000 BP. According to various science-based methods, most Paleolithic sites in the Zerkalnaya River valley existed during the last glacial, 16,000 – 11,000 BP.

Paleogeographic and chronological studies of these sites have encountered several unresolved issues. The principal one concerns the dates of pollen spectra from Ustinovka-5 and 6 and Suvorovo-4 and 6. Verkhovskaya (1996), Verkhovskaya and Kundyshev (1996), and Krupianko and Verkhovskaya (1996) believe that all sites mentioned above should be dated to the Holocene optimum, ca 8000 – 6000 BP. Acknowledging that their conclusion is problematic, Verkhovskaya and Kundyshev (1996) suggest that artifacts from layers with pollen consistent with broad-leaved and coniferous-broad-leaved forest environments were redeposited. Alternatively, they propose that the Paleolithic culture could have continued to exist into the Holocene.

In recent years, considerable progress has been achieved in the ^{14}C dating of Paleolithic sites in the Zerkalnaya River valley (Kuzmin, Jull, 1997; Jull et al., 2000) (see Table). At present, the final Pleistocene age of Suvorovo-4 (16,000 – 15,000 BP) is beyond doubt, whereas the Holocene age of all preceramic sites in this area, contrary to the claim made by Diakov (2000: 166 – 170) is out of question. Kuznetsov (1992: 134) dates the final Upper Paleolithic of Primorye to 11,000 – 8000 BP, which is again in conflict with the firmly established date of Suvorovo-4.

Paleolithic sites in the Ilistaya and Razdolnaya valleys (Gorbatka-3, Ilistaya-1, and Timofeevka-1) were occupied during the final Pleistocene (Gorbatka-3: 13,000 – 10,000 BP, associated with birch and hazel forests) and early Holocene (Ilistaya-1 and Timofeevka-1: 10,000 – 8000 BP, associated with birch and hazel forests with some broad-leaved taxa) (Kuzmin, 1994; Verkhovskaya, 1996). It is possible that the early Holocene ^{14}C date for Ilistaya-1 (ca 7840 BP (Kuzmin, 1994)) refers to the Neolithic rather than to the Paleolithic assemblage (Kuzmin, 2002a), whereas the Paleolithic sites were only occupied during the Late Glacial, 13,000 – 10,000 BP.

Radiocarbon dates for the Final Paleolithic and Initial Neolithic
in the southern part of the Russian Far East*

Site	^{14}C date, BP	Laboratory code	Calendar date, cal BP ($\pm 2\sigma$)	Reference
		Final Paleolithic		
		Amur River basin		
Malye Kuruktachi	14,200 ± 130	SOAN-3287	17,610 – 16,480	Kuzmin, Jull, 1997
	13,815 ± 150	AA-13399	17,170 – 16,020	Ibid
	13,310 ± 105	AA-13398	16,510 – 15,010	»
	12,485 ± 80	AA-17212	15,550 – 14,150	»
	12,010 ± 75	AA-23128	15,320 – 13,660	Jull et.al , 2001
	11,730 ± 70	AA-17211	15,140 – 13,450	Kuzmin, Jull, 1997
	11,355 ± 370	SOAN-3591	14,110 – 12,640	Jull et al., 2001
	10,520 ± 95	SOAN-3590	12,930 – 11,960	Ibid
Goly Mys-4	12,925 ± 65	AA-36277	16,010 – 14,510	»
	12,680 ± 65	AA-36278	15,720 – 14,300	»
	12,610 ± 60	AA-36279	15,630 – 14,240	»
	12,360 ± 60	AA-36281	15,490 – 14,120	»
	10,340 ± 50	AA-36280	12,790 – 11,780	»
		Primorye		
Suvorovo-4	15,900 ± 120	AA-36626	19,650 – 18,360	Jull et,al , 2000
	15,340 ± 90	AA-36625	18,960 – 17,780	Ibid
	15,300 ± 140	Ki-3502	18,960 – 17,680	Kuzmin, 1998
	15,105 ± 100	AA-9463	18,680 – 17,510	Kuzmin, Jull, 1997
Ustinovka-6	11,750 ± 620	SOAN-3538	15,680 – 12,390	Ibid
	11,550 ± 240	GEO-1412	15,070 – 13,010	Kuzmin, 1998
		Initial Neolithic		
		Amur River basin		
Gasya	12,960 ± 120	LE-1781	16,110 – 14,480	Kuzmin, Jull, 1997
	11,340 ± 60	GEO-1413	13,780 – 13,030	Kuzmin, 1998
	10,875 ± 90	AA-13393	13,140 – 12,640	Kuzmin, Jull, 1997
Khummi	13,260 ± 100	AA-13392	16,450 – 14,900	Ibid
	12,425 ± 850	SOAN-3583	16,990 – 12,690	Kuzmin, 1998
	10,345 ± 110	AA-13391	12,830 – 11,690	Kuzmin, Jull, 1997
Goncharka-1	12,500 ± 60	LLNL-102169	15,550 – 14,160	Jull et al , 2001
	12,055 ± 75	AA-25437	15,350 – 13,670	Ibid
	10,590 ± 60	LLNL-102168	12,940 – 12,190	»
	10,280 ± 70	AA-25438	12,750 – 11,700	»
	10,280 ± 70	AA-25439	12,750 – 11,700	»
	9890 ± 230	GaK-18981	12,330 – 10,600	»
Gromatukha	12,340 ± 60	AA-36079	15,480 – 14,110	»
	9895 ± 50	AA-36447	11,550 – 11,200	»
		Primorye		
Chernigovka	10,770 ± 75	AA-20936	13,000 – 12,630	O'Malley et al , 1999
Ustinovka-3	9300 ± 30	KSU-?	10,630 – 10,290	Garkovik, 2000

* Dates were generated mostly on charcoal (sample AA-20936 was organic temper from ceramics)

Final Paleolithic sites in the Amur River basin, then, evidently date between 14,000 – 10,000 BP (or 17,600 – 11,800 cal BP), and those in Primorye, between 11,800 – 11,600 BP (or 15,700 – 13,000 cal BP, Ustinovka-6) (see Table and Fig 2). Open coniferous forests surrounded the sites in the Amur region, while birch and larch forests predominated in Primorye. At ca 14,000 – 10,000 BP, the vegetation already included broad-leaved taxa.

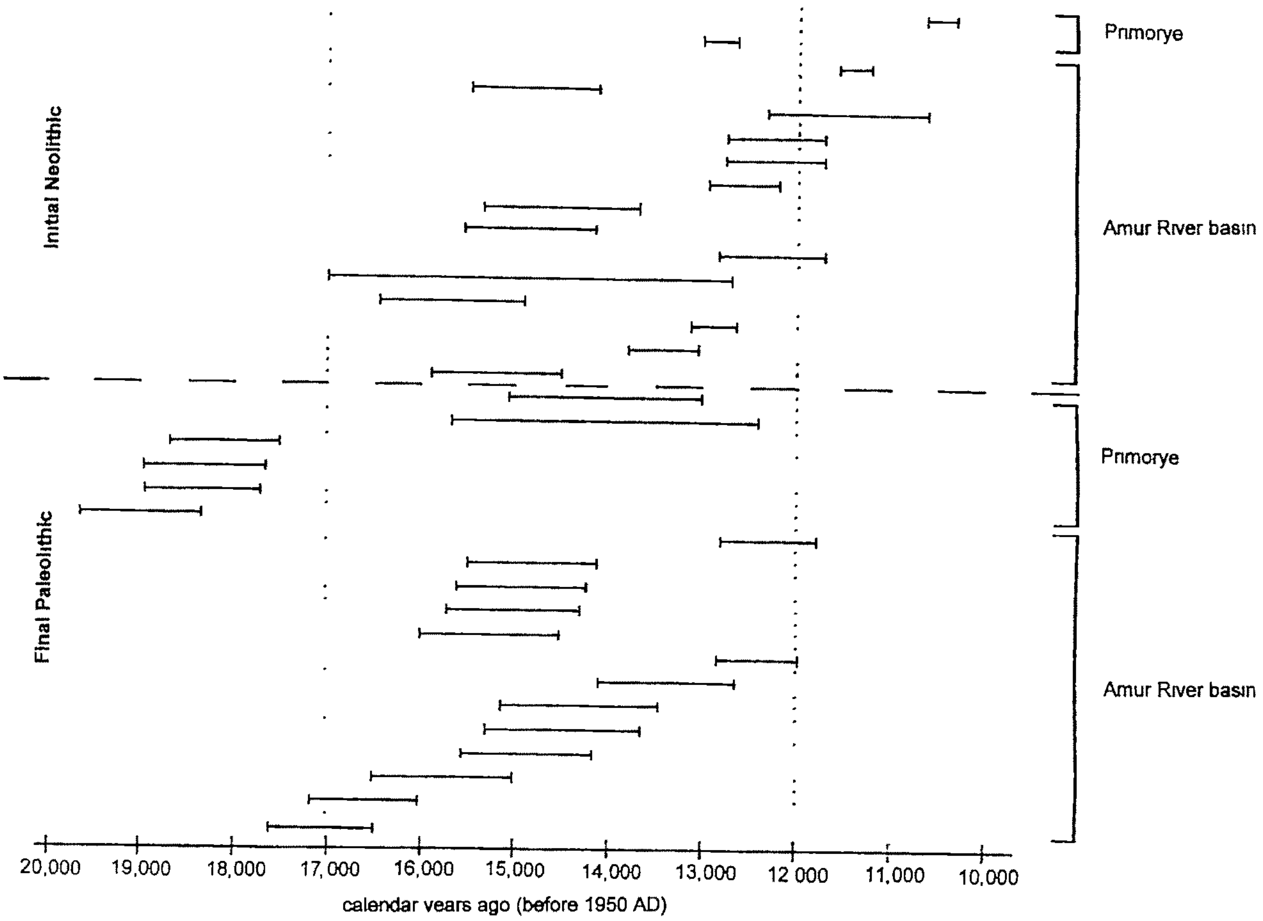

Fig 2 Chronological relationships between calibrated (calendar) radiocarbon dates for the Final Paleolithic and Initial Neolithic in the southern part of the Russian Far East (the position of dates corresponds to their order in Table)

Initial Neolithic sites

In the lower Amur River basin (from the Ussuri River mouth to the Amur estuary), the best studied earliest Neolithic occupation is the Osipovka Culture represented by sites such as Gasya, Khummi, and Goncharka-1 (Medvedev, 1995). Judging by radiocarbon dates obtained from charcoal, it existed ca 13,300 – 10,000 BP (see Table). The sites are situated in the lower part of the bedrock slope of the Amur, 15 – 25 m above the water level. The radiocarbon determinations of Gasya and Khummi, 12,000 – 9000 BP based on organic temper (Jull et al., 1998; O'Malley et al., 1999), generally agrees with the estimate based on charcoal.

Pottery from Gasya yielded thermoluminescence dates of 13,460 ± 1460, 10,430 ± 1160, and 8580 ± 1490 calendar years BP (Kuzmin et al., 2001), which correspond to the uncalibrated radiocarbon range of ca 11,600 – 7800 BP (Stuiver et al., 1998) and are also close to the calibrated dates obtained from charcoal and organic temper (see Table).

The situation at Gasya is quite complicated because the habitation layer is disturbed, sometimes to a considerable depth (Derevianko, Medvedev, 1994). For this reason, the pollen spectra are fragmentary, making it difficult to establish stages corresponding to changes in the local vegetation over time (Chernyuk et al., 1999; Kuzmin et al., 1999). Radiocarbon dates based on charcoal and organic temper are more reliable (Okladnikov, Medvedev, 1983; Kuzmin, 1998; Jull et al.., 1998; Kuzmin, Jull, 1997; Kuzmin et al., 1997).

As the pollen data suggest, the environment changed several times at Gasya during the period of the Osipovka Culture. During the earliest stage (ca 13,000 – 12,000 BP), the climate was rather cold, and the predominant vegetation was light pine and larch forest with large open spaces occupied by meadows. Approximately 12,000 – 11,000 BP, the climate became considerably warmer (Allerød), and the vegetation consisted of open coniferous and coniferous-broad-leaved forests with patches of larch

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forest and peatbogs. Between 11,000 and 10,300 BP (Younger Dryas), an abrupt cooling occurred, resulting in the wide distribution of larch-pine open forests. At the final stage of the culture (ca 10,000 BP), the climate probably became milder again, and the common type of vegetation was open coniferous forest with broad-leaved species.

When the Khummi site was occupied, the vegetation was represented by meadow-steppe with broad-leaved and coniferous trees (Chernyuk et al., 1999). Probably the Osipovka Culture coincides with one of the last interstadials such as Bølling (12,800 – 12,300 BP) or Allerød (11,800 – 11,000 BP) (both dates are cited after (Zubakov, 1986)).

In the profile of Gasya, at a depth of 2.10 – 2.35 m, the pollen of a domesticated cereals were discovered, representing 3 – 8% of the total non-arboreal pollen. In the bottom part of the habitation layer of Khummi, a single pollen grain was found, also identified as that of a cultigen. This fact requires a special explanation since there is no evidence, archaeological or carpological, suggesting that people of the Osipovka Culture practiced agriculture. Apparently, the cultigen pollen was redeposited or introduced from the overlying Late Neolithic, Early Iron Age, and Medieval levels (Derevianko, Medvedev, 1994).

Several authors have discussed the origins of agriculture in the Far East and in Northeast Asia in general (Chang, 1986; Crawford, 1992; Yan, 1992; Underhill, 1997; Cohen, 1998; Kuzmin, Jull, Jones, 1998; Shelach, 2000). The earliest evidence of agriculture (ca 6400 BP) is associated with the Xinle Culture in the lower Liaohe basin, Northeast China (Chang, 1986; Nelson, 1990; Yan, 1992; and others). In the Russian Far East, the earliest reliable evidence attesting to cereal cultivation comes from Primorye and dates from 4200 – 3700 BP (Kuzmin, 2002c; Kuzmin et al., 1998). It would be premature, then, to suggest that people of the Osipovka Culture practiced agriculture between 13,000 – 11,000 BP.

Radiocarbon dates for Goncharka-1 fall within 12,500 – 9890 BP (see Table) (Jull et al., 1999). The pollen spectra indicate that during the early stage of the Osipovka Culture (ca 12,500 – 12,000 BP) the predominant vegetation was open birch and larch forest, later replaced by coniferous-birch and aspen-birch forest steppe with patches of larch and fir-pine forest (ca 10,600 – 9900 BP) (Shewkomud et al., 2001). The earliest habitation stage at Goncharka-1 coincided with warming during the final stage of the Late Glacial (Allerød), while the site was abandoned during a cooler phase at the end of the Pleistocene (Younger Dryas/Preboreal).

In the middle Amur River basin (from the Zeya River to the Ussuri River) the Initial Neolithic is represented by Gromatukha, a site located on the edge of the bedrock slope of the Zeya River, 15 – 20 m above the water level. During a geoarchaeological reconnaissance of this site, conducted in 1999, a sample of charcoal from the hearth discovered in the lowermost stratum was taken for radiocarbon analysis; its radiocarbon date was estimated at 12,340 ± 60 BP (Jull et al., 2001). Also, a sample of sediment was taken for pollen analysis. A prior sample of charcoal yielded a ^{14}C date of 9895 ± 50 BP (1965 – 1966 excavations, sector B, level 3, 1.10 – 1.16 m depth, see Table). Radiocarbon dates based on charcoal do not contradict those based on organic temper (13,300 – 7300 BP) (Jull et al., 1998, 2001; O'Malley et al., 1999; Derevianko et al., 2002) and suggest that the Gromatukha Culture may have appeared as early as ca 13,000 BP. The pollen spectrum of the bottom part of the habitation layer of Gromatukha points to a mixed cold birch forest steppe, open larch forest, and peatbogs environment.

The site of Novopetrovka-2 in the middle Amur River basin (Derevianko, 1970), after which the Novopetrovka Culture is named, has yielded several ^{14}C dates: ca 9700 BP based on charred residues on pottery, and ca 12,700 – 9800 BP based on organic temper (Derevianko et al., 2002). Previously, the pottery from this site was dated to 10,400 – 9800 BP also based on organic temper (Jull et al., 1998; O'Malley et al., 1999). New dates attest to a rather early age of the Novopetrovka Culture, comparable to that of Osipovka and Gromatukha cultures. The dating of pottery from Novopetrovka is still ongoing.

The earliest Neolithic sites in Primorye are Chernigovka and Ustinovka-3. The former site is situated on the gentle slope of the Khanka Plain, while the latter is situated on the second terrace of a small stream flowing into the Zerkalnaya River. Chernigovka is nearly completely destroyed, and the organic temper from recovered pottery yielded a radiocarbon date of ca 10,770 BP (see Table). The geoarchaeological information concerning Ustinovka-3 is less patchy. Its pottery was dated to ca 10,600 calendar years BP by optically stimulated luminescence (OSL) (Kajiwara, 1997), corresponding to 9500 BP on the ^{14}C scale (Kuzmin, 1998: 88 – 89). This agrees with the radiocarbon date based on charcoal: ca 9300 BP (see Table). Pollen data for Ustinovka-3 are ambiguous. While some authors (e.g., (Verkhovskaya, 1993, 1996; Verkhovskaya, Kundyshev, 1996)) believe that the vegetation mostly consisted of open birch forest with some broad-leaved trees, others (e.g., (Garkovik, 1998; Kononenko et al., 2001: 22) propose an open larch, alder, and birch forest with numerous shrubs.

Based on these data, early pottery production and, accordingly, the beginning of the Neolithic period can be dated to ca 13,000 BP (ca 16,500 – 14,500 calendar years BP) in the lower Amur River basin, to at least ca 12,300 BP (ca 15,500 – 14,100 calendar years BP) in the middle Amur River basin, and to ca 10,700 – 9300 BP (13,000 – 10,300 calendar years BP) in Primorye (see Fig. 2). The vegetation of the Amur River basin mostly consisted of birch and coniferous forests, while birch forests with some broad-leaved species predominated in Primorye.

Correlation with adjacent regions of East Asia

According to recent chronological estimates for the Initial Neolithic of East Asia (Zhao, Wu, 2000; Nakamura et al., 2001; Kuzmin, Keally, 2001; Taniguchi, 2002; Kuzmin, 2002b), the earliest sites of that period in southern China date from ca 15,200 – 15,100 BP (Miaoyan), 14,400 – 13,700 BP (Yuchanyan), and 14,200 – 12,400 BP (Xianrendong), while those in Japan date from ca 13,000 BP (Odai Yamamoto-1, Kitahara, and Tokumaru Nakata). Therefore, at approximately 13,000 BP, at least three of the earliest pottery production centers existed in East Asia: southern China, Japan, and the Amur River basin.

The vegetation of East Asia during that period consisted mostly of coniferous forests in the north (Amur region, Primorye, northern Manchuria, Hokkaido) and coniferous-broad-leaved forests in the south (Honshu; eastern central and southeastern China; southern Manchuria) (Tsukada, 1986, 1988; Liu, 1988; Morley, Heusser, 1989; Heusser, 1990; Morley et al., 1991; Verkhovskaya et al., 1992; Winkler, Wang, 1993). The appearance of broad-leaved species such as Manchurian nut (*Juglans mandshurica* Maxim.), may have been one of the factors responsible for the early appearance of pottery. Indeed, nuts of this species can be consumed only after the removal of harmful substances by soaking the nuts in water for several days. The wide use of this important source of food, then, was only possible after the introduction of pottery. Other factors might have included sedentism (at Khummi, remains of a dwelling were discovered (Lapshina, 1999: 33 – 35)) and intensification of fishing, with particular focus on salmonid exploitation (Medvedev, 1995: 235).

Conclusions

The geoarchaeological analysis of sites representing the Paleolithic to Neolithic transition in the southern part of the Russian Far East demonstrates that the production of pottery in the middle and lower parts of the Amur River basin emerged very early, ca 13,300 – 13,000 BP (ca 16,500 – 14,500 calendar years BP, or 14,550 – 12,550 BC). In the adjacent areas of the Amur River basin and in Primorye, Final Paleolithic cultures survived, attesting to the chronological overlap of various cultural stages in prehistoric East Asia. Specifically, in the southern part of the Russian Far East, the Final Paleolithic coexisted with the Initial Neolithic during the period of ca 17,000 – 12,000 calendar years BP (see Fig. 2). While the role of the environment as a factor that had affected the emergence of pottery in East Asia is not yet well understood, it is beyond doubt that the increase of plant and animal resources (primarily the higher role of anadromous fish) did play a certain role in human adaptation to the Late Glacial and Early Holocene environment. In the near future, the functions of clay vessels in the Amur region will be assessed using the lipid composition analysis.

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DISCUSSION

THE ISSUE OF THE MIDDLE TO UPPER PALEOLITHIC TRANSITION

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THE EARLIEST REPRESENTATIONS OF SYMBOLIC BEHAVIOR BY PALEOLITHIC HUMANS IN THE ALTAI MOUNTAINS*

This paper is dedicated to the late VT Petrin,
who studied the Kara-Bom site for many years

Introduction

Archaeological investigations carried out during the past two decades in the Russian Altai have generated archaeological evidence allowing us to regard this region as one of the dispersal areas of Upper Paleolithic culture. Well-stratified, multi-layered cave and open-air sites have yielded lithic artifacts attributable to the transition period from the Middle to the Upper Paleolithic and to the early Upper Paleolithic. Available archaeological materials have provided solid ground for insight into developmental trends of material culture as well as for the reconstruction of the paleoenvironmental conditions during the first half of the Karga Interstadial (ca 50 – 30 ka, SPECMAP Oxygen Isotope Stage 3) (Derevianko, 2001; Derevianko et al., 2001; The Paleolithic..., 1998; Arkheologia, geologia..., 1998; Markin, 1996; Derevianko, Petrin, Rybin, 2000; Agadjanian, 2001)**.

Correlations between changes noted in material culture and those in subsistence and behavioral strategies and in the social and spiritual aspects of human life have not yet been fully investigated. The data obtained in the course of studies of the early Upper Paleolithic in Africa, Europe, and the Near East suggest that changes in the social and spiritual aspects of human life may have been even greater than those noted in the development of lithic technology. Analogous processes may have occurred in the Altai. Available data have shown that the number of sites attributable to the early Upper Paleolithic is greater in comparison to localities dating from preceding periods. The living areas of such sites were used more extensively. People extended their occupation areas and began to produce non-utilitarian items, namely items of personal adornment in stone and bone. These particular artifacts suggest the ability of their creators to engage in activities other than those aimed merely at subsistence and tool manufacturing.

Currently, archaeologists have no reliable evidence suggesting symbolic behavior among Middle Paleolithic humans in South Siberia. This fact alone, however, cannot be regarded as a basis for inferences concerning these peoples' practical incapacity for conscious creative activity in the sphere of art. Suffice it here to mention the series of Middle Paleolithic burials in Eurasia (noting, however, that not all researchers acknowledge the premeditated character of these interments as well as the fact that Neanderthal

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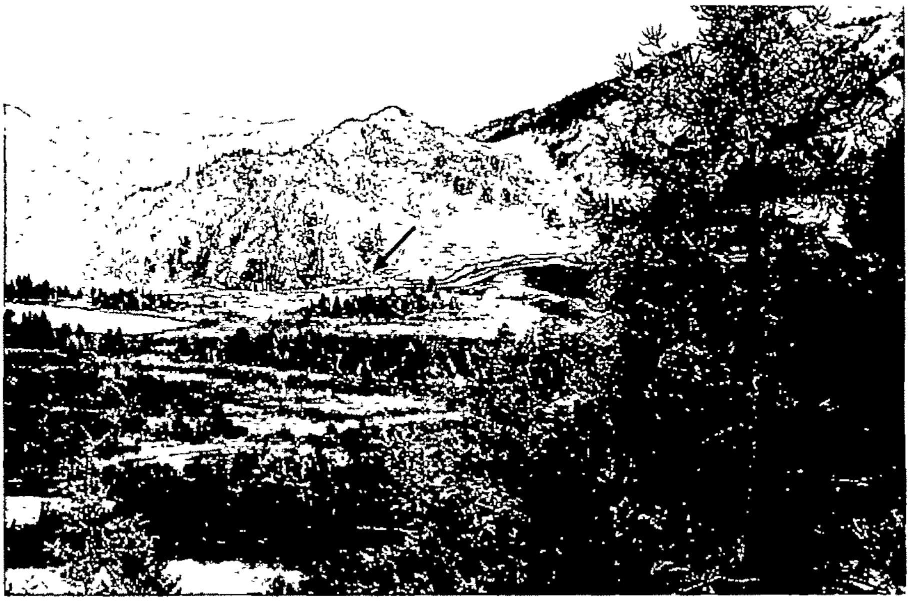

Fig 1 The Kara-Bom site.

populations might have had an atypical attitude about death – see the recent discussion in (Riel-Salvatore, Clark, 2001).

The available facts suggest that the "explosive" changes that occurred in human behavior during the Middle to Upper Paleolithic transition in South Siberia are unconnected with the appearance of a new species of *Homo* in this region. Personal adornments could be considered the most vivid and concrete representations of these changes. Manufacturing and wearing such ornaments can be interpreted in terms of group and individual self-identity. Such items might have served as markers of the individual status of the bearer, or could have been connected with various cult activities. Materials currently in hand need thorough analysis and a synthesis of available facts. Presently, no convincing data indicate the time of the initial appearance of ornaments in the South Siberian Paleolithic nor the context of their usage and role in human symbolic behavior.

Certain explanations can be derived from archaeological materials recovered from the Kara-Bom site, one of the most important sites illustrating the Middle to Upper Paleolithic transition in North Eurasia. Presently, specific lithic technocomplexes from only one excavation unit of the site, occupying a considerably large area, have been published (it is presumed that description of these materials will be published in a series of volumes following the completion of excavations at the site) (Derevianko et al., 1998; Derevianko, Petrin, Rybin, 2000). The published materials do not include artifacts belonging to a unique complex of items illustrating symbolic behavior of humans, thus the present authors provide the necessary information in this paper.

Geographical setting of the Kara-Bom site

The Kara-Bom site (N 50°43'; E 85°42') is located in the Yelo Basin of the intermontane depression system of the Central Altai mountains. The flat floor of this depression is elevated to an absolute height of 1,000 to 1,100 m; the surrounding mountain ranges rise to 2,300 m above sea level. The absolute elevation of the site is 1,120 m asl. The site is located in the foothills of a schist cliff (Fig. 1). Culture-bearing horizons are located adjacent to the southern face of the cliff, which receives direct sunlight throughout the day and is protected from prevailing winds A fresh water spring is located in the immediate vicinity of the site. Stratigraphic observations suggest that this spring also functioned in antiquity. The site has an unobstructed view over the entire valley. The narrowing valley forms an amphitheater several hundred meters from the site, where a low pass provides access to a neighboring, dry valley. This pass was probably used by animals coming to water and might have served as a natural trap in their pursuit (Fig. 2 – 4).

The history of investigations at Kara-Bom

Excavations at the site began in 1980 under the supervision of A.P. Okladnikov with work carried out in an area later designated as "Excavation Area 1" (see Fig. 3). Initially it was thought that the soft sediments at the site were severely disturbed by flowing water, hence excavations were executed in arbitrary layers from 25 to 30 cm thick. However, after the discovery of an intact "Levallois-Mousterian" culture-bearing horizon within Layer 2 (Okladnikov, 1983) excavations were executed

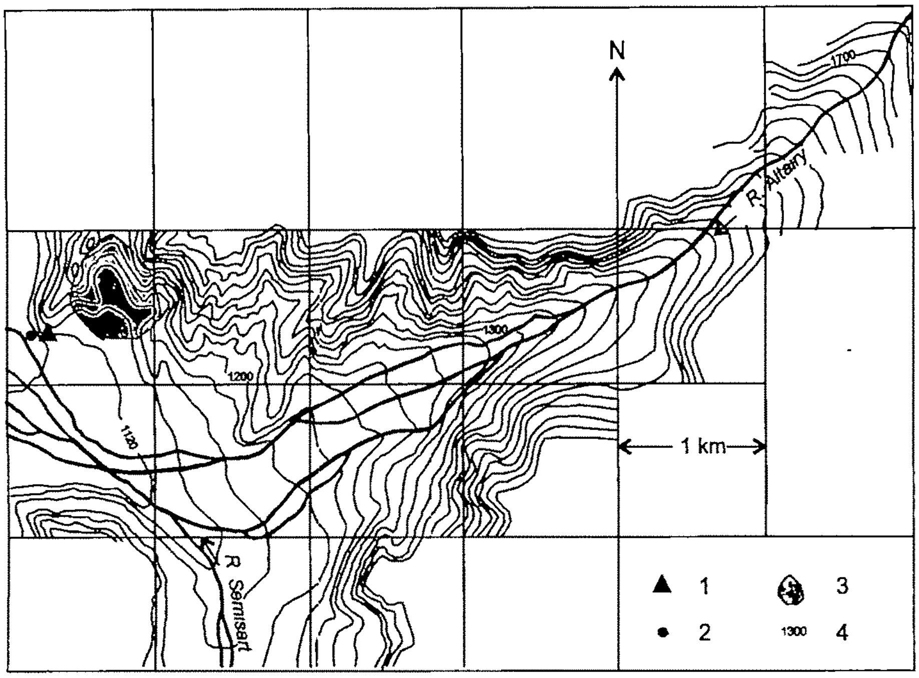

Fig 2. Plan map of the Kara-Bom site
1 – location of the Kara-Bom site, *2* – spring, *3* – presumed hunting zone, *4* – absolute elevation asl (in meters).

by stratigraphic layers. The excavation area, which suggested undisturbed deposition in part of the soft sediments, was designated a "workshop". According to published data and Okladnikov's field records, this "workshop" was established within Layer 3 (following Okladnikov's enumeration scheme), in sediments with a considerable admixture of debris: "yellowish-brown sandy loam, with admixture of large plates of schist" (Ibid.: 7). The maximum thickness of the lithological layer is 1.6 m. In 1980, excavations of the Kara-Bom "workshop" were not finished, although in other areas of the site, excavations reached lower layers. In 1987, the Altai Team of the North Asian Complex Archaeological Expedition (A.P. Derevianko, Expedition Head; V.T. Petrin, Team Leader) renewed work at the site, which proceeded with a short break until 1993.

During the period of fieldwork, an area of 300 sq. m was excavated. A grid system with Cyrillic alphabetical designations was established. A hearth containing charcoal fragments and bones surrounded by concentrated artifacts was noted in grid quadrants И, К/8 – 9. In 1991, excavations in Excavation Area 1 were completed, and investigations in quadrants Л, М/7 –9 revealed an area at the same stratigraphic level as the "workshop" in which bone ornaments were noted in association with fragments of natural mineral pigments.

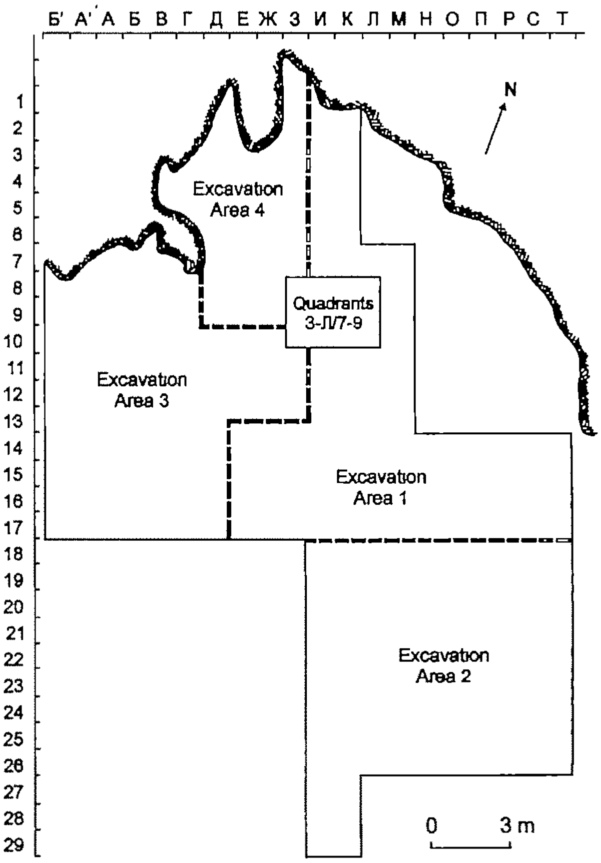

Fig. 3. Excavation plans of Kara-Bom.

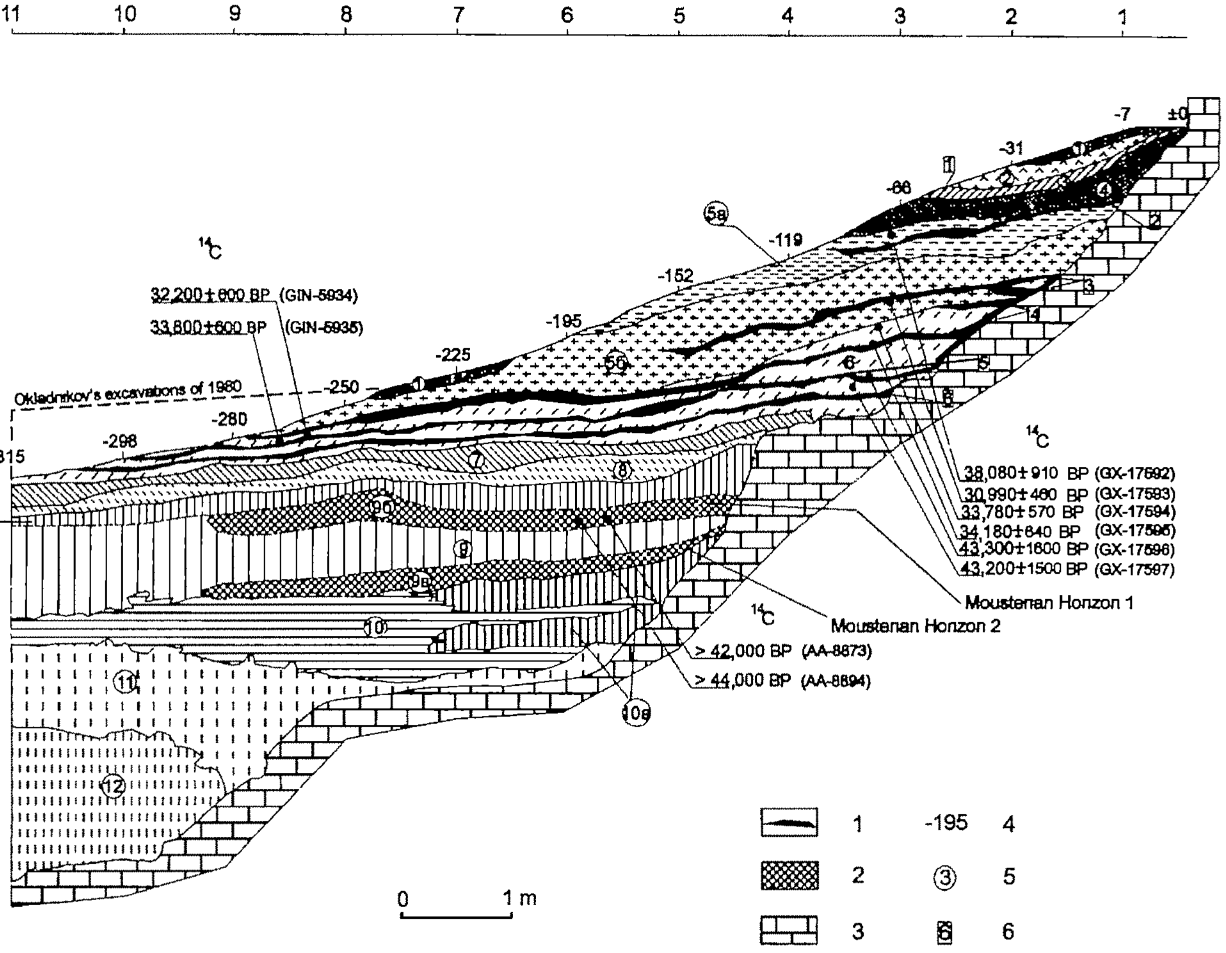

Fig 4. The Kara-Bom stratigraphic profile along the И/1 – 11 line.
1 – Upper Paleolithic occupation horizons, *2* – Mousterian culture-bearing horizons, *3* – bedrock, *4* – leveling with respect to the established zero, *5* – lithological layers' designations, *6* – culture-bearing horizons' designations.

In 1992 – 1993, an area designated Excavation Area 4 was investigated, revealing six culture-bearing horizons (enumeration begins at the top of the profile) attributed to the Upper Paleolithic (Occupation Horizons 6 – 1) and two Middle Paleolithic horizons (Mousterian Horizons 2 and 1). The results of investigations in Excavation Area 4 were published in a separate volume (Derevianko et al., 1998). Based on the results of these investigations, we have established a single arbitrary unit, homogeneous from the stratigraphic point of view, including the workshop (1980 and 1987 investigations), quadrants Л, М/7 – 9 of Excavation Area 1 (1991 investigations), and Excavation Area 4, Occupation Horizons 6 and 5 (1992 – 1993 investigations). This stratigraphic unit yielded the site's earliest Upper Paleolithic deposits, including a presumably transitional lithic industry. In 1990 – 1992 investigations were carried out in Excavation Areas 2 and 3 (see Fig. 3). Soft sediments in these units were redeposited, excluding the northern portion of Area 2 where several hearths and clearly defined manufacturing zones were identified.

Stratigraphy, chronology, and paleogeography of the Kara-Bom site

The principal stratigraphic profile established in Excavation Areas 1 and 4 containing the arbitrary stratigraphic unit, was described by Nikolayev (1998).

The ca 3.5 m thick stratigraphic sequence was subdivided into three major lithological units*.

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* In the present paper, we provide a description of those lithological layers containing culture-bearing horizons. For a full description of the profile, see (Derevianko et al., 1998; Derevianko, Petrin, Rybin 2000).

Slope deposits formed the uppermost unit, which contains fine aeolian dust and grayish-yellow sandy loam containing debris. This unit comprises Strata 8 – 1. Strata 4 – 2 seem to have been accumulated during the Sartan cold period (the last Pleistocene cold oscillation, OIS 2). These strata were traced only in areas adjacent to the cliff; at a distance of 3 m from the cliff they disappear due to post-depositional erosion. The uppermost portion of Stratum 4 yielded Upper Paleolithic remains termed Occupation Horizon 1. Stratum 5 (brownish-gray loam) was further subdivided into two substrata: the upper (5A) contains Upper Paleolithic Occupation Horizon 2, while the lower (5Б) contains considerably less debris and encompasses Occupation Horizon 3. Lithological Stratum 6 consists of gray coarse rock fragments poorly weathered (or not weathered at all), schist gruss and gravel cemented by sandy loam. Within Stratum 6, starting from its central portion, large (20 – 25 cm) schist fragments were noted in horizontal positions; their number increases toward the bottom of this stratum. The uppermost portion of Stratum 6 revealed an admixture of humus (buried soil?). Occupation Horizon 4 was established at the border with substratum 5Б. Occupation Horizon 5 was established in the middle of Stratum 6, and Occupation Horizon 6 was identified close to the lowermost portion of Stratum 6. Lithological strata 6 and 5 wedge out at a distance of 11 m from the cliff.

Two Middle Paleolithic strata were traced within the limits of Lithological Unit 2. This unit consists of a brownish-gray loessic loam impregnated with sand; the fraction of debris is smaller in comparison to overlying Stratum 9. This homogeneous diluvial stratum was subdivided into three substrata. Middle Paleolithic Horizon 1 was established in association with substratum 9Б, and Middle Paleolithic Horizon 2 was traced within substratum 9B. Lithological unit 3 overlays bedrock, and represents cryoturbated slumping deposits (Strata 10 – 12) consisting of weathering crust and greenish-gray silt-containing loam of subaquatic origin. This unit did not yield any artifacts.

Samples for AMS and ^{14}C dating were collected from the entire sequence of deposits exposed in grid quadrant И/5 allowing the establishment of a relative chronological scale. Two infinite dates were generated for Mousterian Horizon 1: >42 ka BP (AA-8873) and > 44 ka BP (AA-8894); Occupation Horizon 6 yielded a date of 43,200 ± 1500 BP (GX-17597) and Occupation Horizon 5 yielded a date of 43,300 ± 1600 BP (GX-17596); both horizons were established within lithological layer 6.

A date of 34,180 ± 640 BP (GX-17595) has been generated on a charcoal fragment from Occupation Horizon 4 that was traced at the border separating lithological layers 6 and 5; the uppermost portion of lithological layer 6 yielded a determination of 33,780 ± 570 BP (GX-17594), and Occupation Horizon 3 from substratum 5Б was dated to 30,990 ± 460 BP (GX-17593). One more date 38,080 ± 910 BP was obtained on sediments from the contact zone of Strata 5 and 4 (between Upper Paleolithic Horizons 4 and 3). However, the sample was likely taken from a rodent burrow originating in a stratum not associated with any cultural remains (Goebel, Derevianko, Petrin, 1993). In addition, two conventional radiocarbon dates: 32,200 ± 600 BP (GIN-5934) and 33, 800 ± 600 BP (GIN-5935) were generated in the Institute of Geology of the Russian Academy of Sciences in Moscow. The former was obtained on bone collagen recovered from Stratum 7, the latter on charcoal from sediments of unclear cultural association located higher in the profile, above the hearth in Stratum 6. Both dates were generated on samples taken from the profile of quadrant И/9. We do not regard these two latter dates as reliable for two reasons. First, conventional radiocarbon analysis is anachronistic; it was developed in the 1960s – 1980s for the analysis of relatively large organic samples. Second, one must bear in mind that samples were collected from the area that was excavated in 1980 by Okladnikov's expedition. Bones and charcoal fragments were covered by a thin layer of soil not more than 10 cm thick. During the seven years that those sediments were essentially exposed, they may have become contaminated. In addition, the date of the upper sediments turns out to be a millennium earlier that that obtained for the lower sediments, though these two layers are separated by sediments about 50 cm thick. The resulting inversion causes us to prefer the sequence of AMS age determinations.

As is the case with any other site located in montane slope deposits, Kara-Bom's geological history is rather complicated. Several factors have impacted depositional processes.

1. Hydrological regime in antiquity: clear signs of aquatic post-depositional disturbance were noted only in Excavation Area 3 (see Fig. 3);

2. Erosion processes stemming from the flow of glacial melt water. Exposed rocks bound the site on the north and west, and by the Semisart River to the south. In the past, the terrace platform of Kara-Bom formed by slope deposits extended from rock outcrops much farther into the valley, a fact evident in the location of strata within the profile. Powerful streams originating in cirque-like reservoirs located above the site later destroyed this part of the terrace. Soft sediments bearing signs of temporary wash out processes were noted in the profile of Excavation Area 2;

3. Gravitational and erosional disturbances caused by slope processes at the site. The stratigraphic profile of the site shows that strata directly adjoining the schist

outcrop lie in sub-horizontal positions unlike the steeply dipping contemporary surface. Eléven meters from the schist outcrop, the deposits are truncated as a result of gravitational slumping and washing out. Due to these particular processes, no Sartan loess sediments have been preserved at the site. Remains of these soft sediments were traced in rodent burrows located no farther than 2 m from the cliff. Thus, only the area including Excavation Areas 1 and 4 as well as the upper portion of the northern part of Excavation Area 2 protected by the rocky barrier in the north and northeast, shows *in situ* deposition and was not fully affected by subaquatic and slope-related processes. The intact character of deposits is suggested by the fact that clear remains of dwelling structures (e.g., hearths, areas of burnt soil, activity areas yielding concentrations of artifacts that can be refitted; it should be noted that artifacts recovered from a single or different clusters can be refitted) have been detected only within the specified area.

Paleoenvironmental reconstruction of the Yelo Basin during the Late Pleistocene has been based on data drawn from palynology (Simonov, Malayeva, Kulikov, 1998), geology and geomorphology (Nikolayev, 1998), and paleopedology (Dergacheva, Fedeneva, 2001). Middle Paleolithic culture-bearing horizons 2 and 1 apparently date from the second half of the Zyrianka Glacial and the early Karga Interstadial. The climatic conditions of that time can be described as follows. The initial occupation of the site took place under cold and relatively dry continental climatic conditions. The Zyrianka vegetation community was characterized by forestless cold-arid steppe floral associations that could have extended to the margins of glaciers. With the onset of a relatively warmer and wetter period, the area was covered by pine forests with admixture of broad-leaved trees. The final Zyrianka period was marked by a general cooling of the climate; montane glaciers descended to absolute elevations of 1,360 – 1,460 m. Areas of lower elevation were covered by mixed forests. The Karga Interstadial comprises three warm periods interchanged by relatively cold episodes, not as severe as during the preceding stadial. The warmest periods, during which the site was occupied by humans (Upper Paleolithic Occupation Horizons 6 and 5) are characterized by predominantly arid steppe floral associations. Vegetation of those periods varies by vertical elevation and by the exposure of montane slopes. South-facing slopes below 1,300 m above sea level were covered by steppe vegetation, while north-facing slopes yielded forest-steppe associations. Higher in the mountains, a zone of mostly coniferous forests occurred with an admixture of deciduous and broad-leaved species (e.g., *Corylus*, *Ulmus*, *Acer*, *Alnus*). Still higher, a zone of Alpine and sub-Alpine vegetation dominated. In summary, climatic conditions during Oxygen Isotope Stages 3 and 4, excluding the glacial maximum, were characterized by a mosaic of vegetation communities generally favorable for human habitation.

Cultural characteristics of the Kara-Bom industry

Artifacts recovered from Kara-Bom demonstrate a cultural sequence of industries dating from the second half of the Middle Paleolithic (Middle Paleolithic Horizons 2 and 1) through the Initial Upper Paleolithic (Upper Paleolithic Horizons 6 and 5) to the early Upper Paleolithic (Upper Paleolithic Horizons 4 – 1). The Middle Paleolithic industries are mostly characterized by parallel and Levallois convergent reduction patterns on tabular cores (Rybin, 1998) (Fig. 5, 6). The Middle Paleolithic reduction strategy begins with the initial stage of stone reduction when rocks were split along natural edges. Further modification was executed through unidirectional parallel flaking resulting in the detachment of large, massive blades. Remodification executed by a series of convergent detachments further reduced nuclei through unidirectional convergent flaking. Within a single reduction cycle, from two to three Levallois points could be removed. The final stage of reduction was mostly accomplished through parallel flaking. During all stages of reduction, the convex lateral surface of the core was rejuvenated through removals of *éclats débordants*.

Within this tool kit, two major categories of tools have been established: Levallois tools including points, notch-denticulate tools, retouched blades, backed knives fashioned on *éclats débordants*, and *racloirs*; and Upper Paleolithic tools including *grattoirs*, burins, and borers. We believe that the Upper Paleolithic industries identified in Gorny Altai are the result of the autochthonous development of local Middle Paleolithic technocomplexes.

Major changes have been noted in the primary reduction strategy utilized in the production of artifacts recovered from early Upper Paleolithic Horizons 6 and 5 (see Fig. 5, 6). Analyses of these collections suggest a transition from Levallois reduction to the technology of recurrent blank removals from prismatic and narrow-face cores as well as the appearance of blade and microblade production. Reduction strategies of both the Upper and the Middle Paleolithic are based on the detachment of large, long blades as basic blanks. Upon exhaustion of the core, flaking was executed from its narrow face, from which small blades and microblades were detached. In some cases, massive *éclats débordants*, which represent an abundant by-product

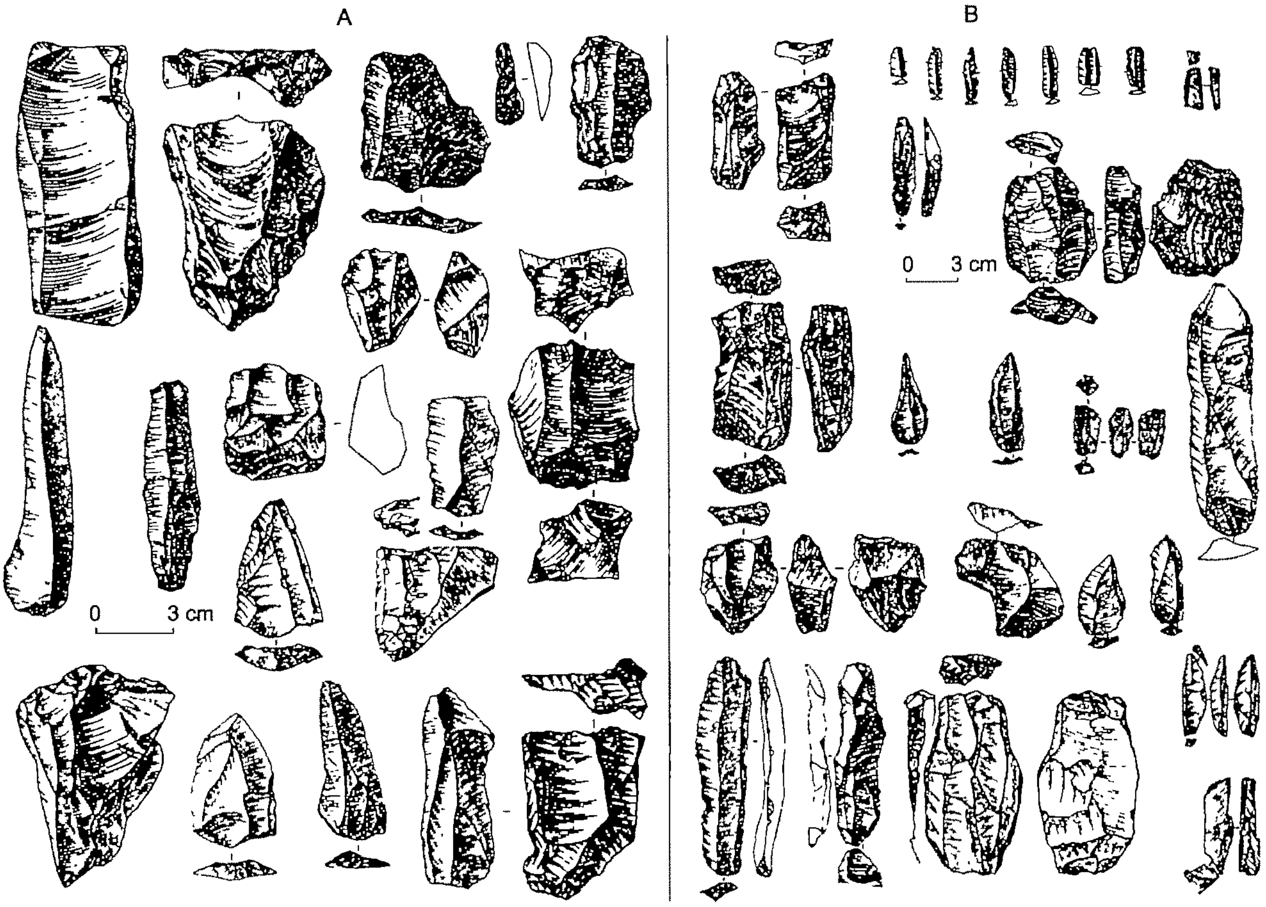

Fig. 5. Lithic artifacts from the Middle (*A*) and early Upper Paleolithic (*B*) technocomplexes of Kara-Bom.

category of this reduction strategy, served as blanks for fashioning microblade cores. Common features that have been noted in the Middle and the Upper Paleolithic industries at Kara-Bom include the predominant employment of parallel flaking and marked similarity in the sequence of technological stages in reduction strategies.

The early Upper Paleolithic technocomplexes of Kara-Bom show certain features of Levallois technology, for instance elongated Levallois points. The early Upper Paleolithic collection from Kara-Bom comprises notch-denticulate tools, retouched blades (including large, massive specimens), end-scrapers, multifaceted burins, backed knives, and points fashioned on blades with bifacially flattened bases (reminiscent of Emireh points). The specificity of the Kara-Bom industry lies in the extensive use of combination tools. The early Upper Paleolithic technocomplexes of Kara-Bom show close similarity to synchronic transitional industries of the Near East (e.g., Üçağızlı, Boker Tachtit) and Central Europe (e.g., Bohunice).

Spatial analysis of ornaments within the established study area

Distribution of artifacts within the study area comprising quadrants 3-Л/7 – 9. Grid quadrants 3-Л/7 – 9 seem to represent a homogeneous activity and dwelling locus yielding a set of ornaments and natural pigments. Spatial distribution of ornaments is described on the basis of data obtained during excavations of quadrants 3-Л/7 – 9 (Fig. 7). The finds were recovered from the lower portion of lithological layer 6 consisting of gray sand and loam impregnated with gravel and schist plates. The area under study totals 11 sq. m. The difference in relative levels of the finds within this layer is not more than 38 cm: from –352 cm (from zero datum) in the southwestern corner of the study area to –314 cm in the unit's northeastern corner; the average levels vary from –316 to –340 cm, which corresponds to the general dip of the excavation unit's floor.

The eastern part of the study area (quadrants 3, И/7 – 9; Upper Paleolithic Occupation Horizon 5) produced

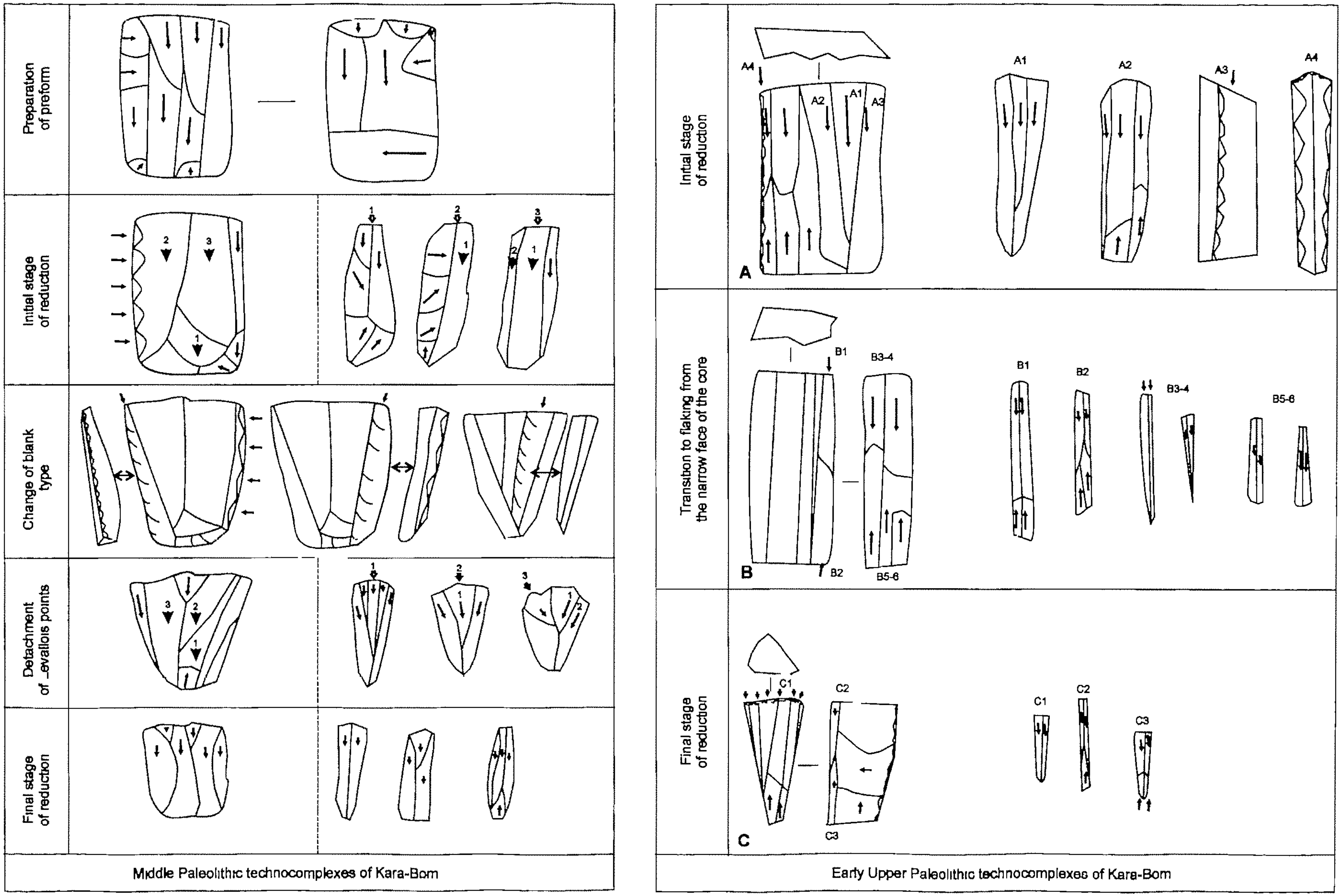
Preparation of preform
Initial stage of reduction
Change of blank type
Detachment of Levallois points
Final stage of reduction
1
2
3
Middle Paleolithic technocomplexes of Kara-Bom
Initial stage of reduction
Transition to flaking from the narrow face of the core
Final stage of reduction
A
A1
A2
A3
A4
B
B1
B2
B3-4
B5-6
C
C1
C2
C3
Early Upper Paleolithic technocomplexes of Kara-Bom

Fig 6 Technological sequence of stone reduction in the Kara-Bom technocomplexes.

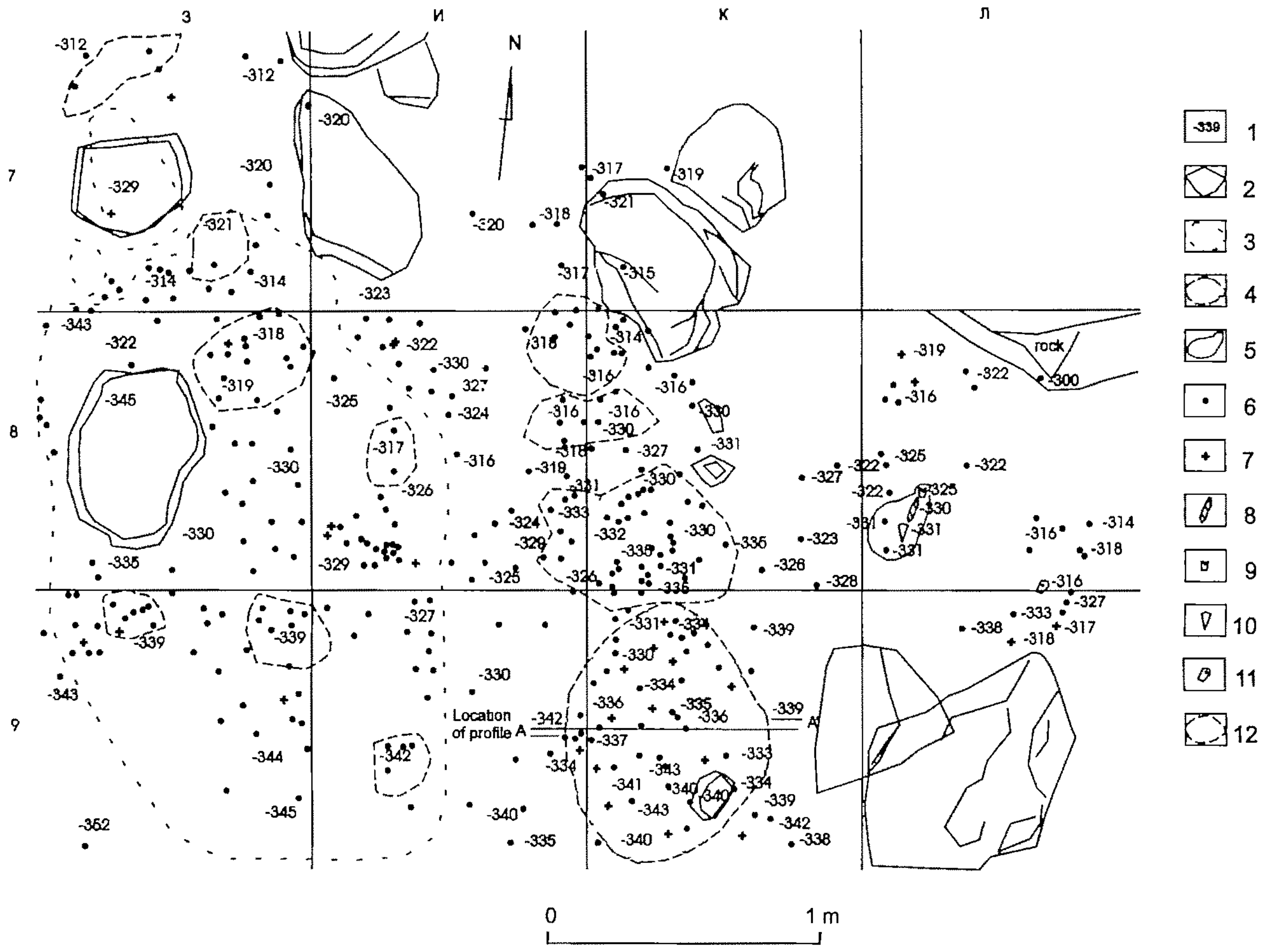

Fig 7. Excavation plans of quadrants З – Л/7 – 9 at Kara-Bom.
1 – depth levels with respect to the established zero (in cm), *2* – stones, *3* – areas of burnt soil, *4* – hearths, *5* – area of pigmented soil, *6* – lithic artifacts, *7* – bones, *8* – pebble in the area of pigmented soil, *9* – pendant 1, *10* – pendant 2 (tooth), *11* – pendant 3, *12* – artifact cluster

the most abundant collection of artifacts and numerous schist plates. A dense concentration of lithic artifacts, bones, and charcoal fragments occurred in quadrants З, И/7 – 9. The soil within these quadrants is heavily burned and demonstrates a reddish coloration. Concentrations of burned soil and charcoal were noted within quadrants З, И/4 – 9. In quadrants З, И/5 – 8, a pavement of stone slabs in the form of long oval was noted. No finds were discovered beneath the stones, suggesting that the pavement was constructed during the accumulation of the layer.

This area yielded 210 lithic artifacts including three cores and 34 tools (constituting 16.1% of the total collection of artifacts from this area). A dense concentration of lithic artifacts and burned animal bones was noted in association with an area of burned soil from 10 to 15 cm thick. As was mentioned above, quadrants И, К/7 – 9 were excavated in 1987 and were included in the "workshop" described as a single behavioral complex by its excavator, Okladnikov. According to our stratigraphic profile, the "workshop" falls in the lower portion of lithological layer 6 and constitutes a part of Upper Paleolithic Occupation Horizons 6 and 5 (which were not identified during the 1980 and 1987 excavations). This attribution is supported by Okladnikov's description of the layer: "yellowish-brown sand and loam in the middle of Stratum 3," filled with schist slabs and plates (Okladnikov, 1983), which fully corresponds to the lithological characteristics of layer 6, established in 1990 Apparently, Okladnikov did not distinguish layers 8 through 4 of the currently accepted lithological sequence at Kara-Bom, but designated a thick Stratum 3 during the early stages of investigations at the site.

Second, spatial analysis of the vertical distribution of artifacts from the "workshop" suggests two horizons

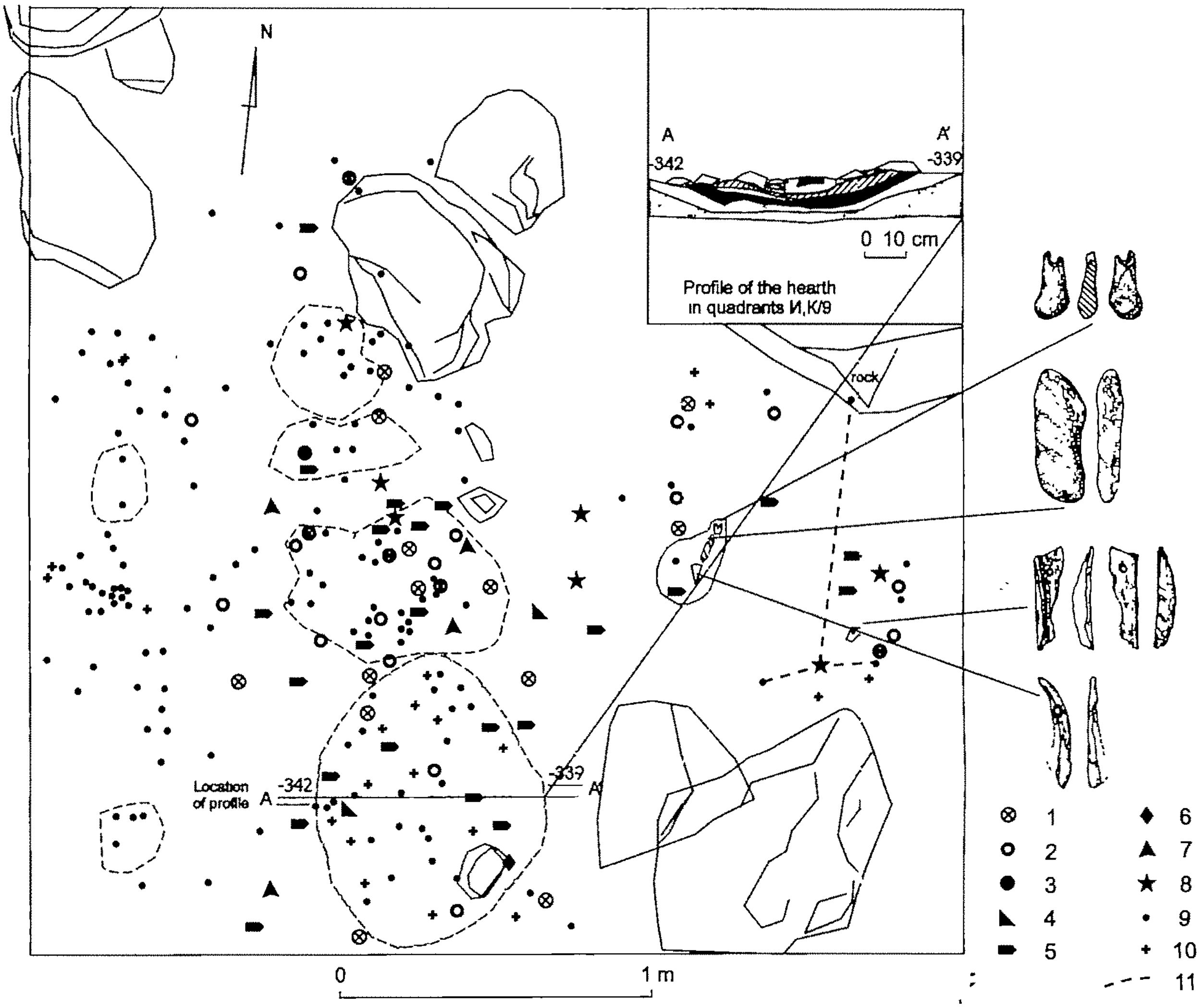

Fig 8. Spatial distribution of artifacts within quadrants И-Л/7 – 9.
1 – grattoirs, *2* – notch-denticulate tools, *3* – combination tools, *4* – knives, *5* – retouched blades, *6* – burins, *7* – points, *8* – cores, *9* – spalls, *10* – bones, *11* – refittable spalls

of artifact deposition, which are more distinct near the cliff and less distinct in the southern portion of the study area. Similar stratigraphic positioning of artifacts was noted in Occupation Horizons 6 and 5, which merge along the line connecting quadrants 8 and 9. The assemblage described above was recovered from the upper presumed "workshop" horizon. Refitting analysis allows us to establish correlations between certain "workshop" artifacts and those from Occupation Horizons 6 and 5. No cases of refitting of artifacts from Occupation Horizons 6 and 5 with those associated with the later occupation horizons have been established.

A zone within quadrants И, К/7 – 9 revealed a hearth pit (Fig. 8); the bottom of this artificial pit is 10 cm below the ancient activity surface. The filling of the pit consists of laminations of charcoal, burned artifacts and numerous bones, ash, and reddish burned soil. The upper layer in the hearth consists of ash and contains several slabs, probably representing the remains of a stone pavement. Below, a layer of charcoal fragments was noted resulting from the burning of shrubby vegetation. It overlies a layer of reddish burned soil. Vertebrate faunal remains (identified by N. Ovodov) were recovered in association with a cluster of artifacts: a tooth and a scapula fragment of *Coelodonta antiquitatis*, five teeth and two rib fragments of *Equus* sp., a vertebra of *Lepus tolai*, a mandible fragment of *Bison* sp., five rib fragments of *Ovis* sp, and 84 fragments of unidentifiable bone. Large schist blocks and rock outcrops adjoin the hearth to the north and the east. A total of 198 artifacts were recovered. Within this collection, six nuclei (Fig. 9, *1* – *3*, *6*) were identified. All are small, exhausted specimens, except one core, which demonstrates the initial stage of reduction (see. Fig. 9, *6*). Such cores were used for the detachment

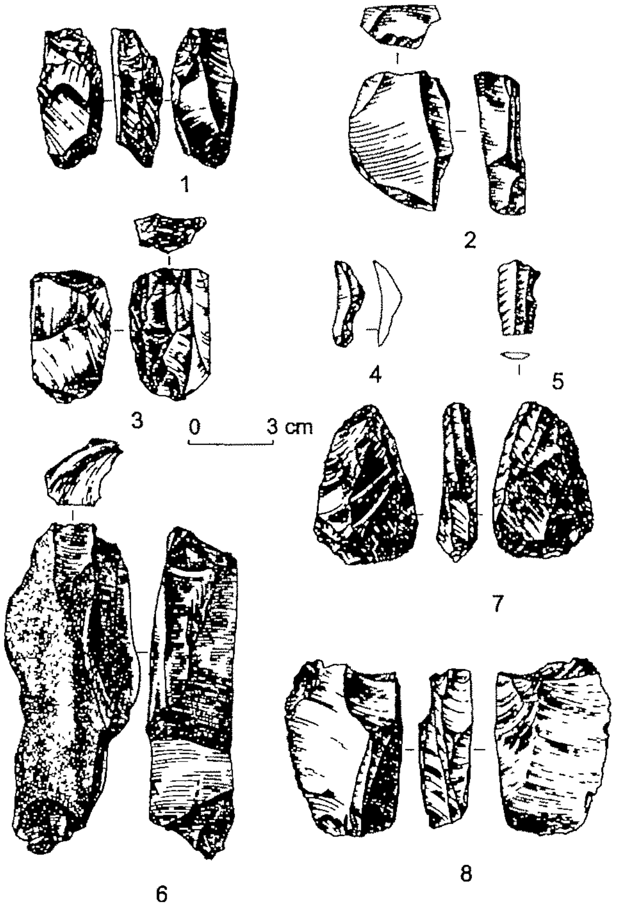

Fig. 9 Lithic artifacts from quadrants И, К/7 – 9 adjacent to the hearth at Kara-Bom.

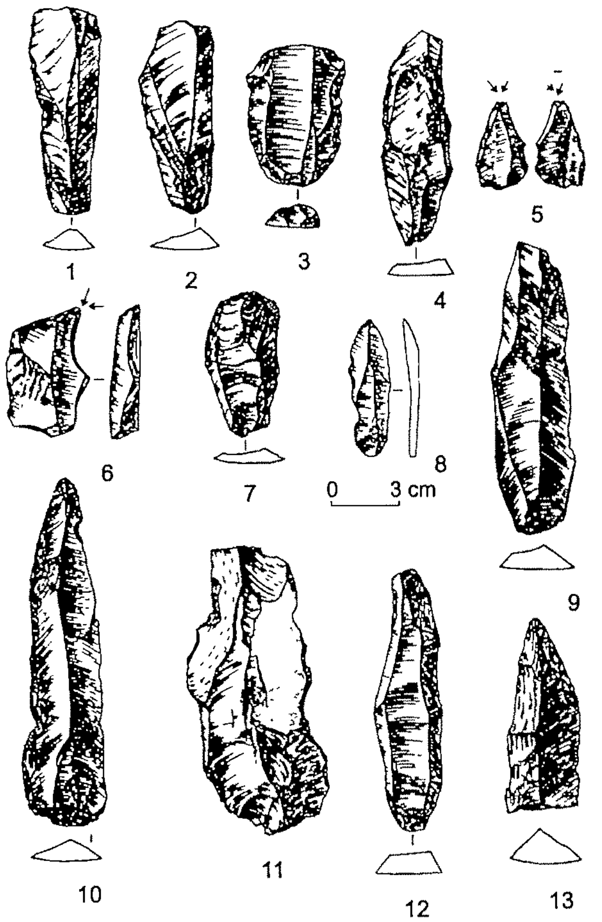

Fig 10. Lithic artifacts from quadrants И, К/7 – 9 adjacent to the hearth at Kara-Bom.

of bladelets and microblades (see Fig. 9, *4*, *5*). Two cores were modified into tools, a technique characteristic of the Kara-Bom industry. One of them was converted to a *grattoir* (Fig. 9, *7*); the other was employed as a knife (Fig. 9, *8*).

A series of 141 unretouched spalls includes 12 large blades (Fig. 10, *2*, *9*). Such artifacts were employed without additional secondary treatment, a fact suggested by the presence of irregular use-wear signs on their lateral edges. Presumably, these artifacts were transported to the site from elsewhere, since no nuclei of suitable size bearing negative scars of removals were noted in the collections. The tool kit comprises 51 tools (25.7% of the total artifacts) including the following categories: *grattoirs* (n=11, or 21.5% of the total tools) (see Fig. 9, *7*; 10, *7*); notch-denticulate and notched tools (n=11, or 21.5%) (see Fig. 9, *5*; 10, *1*, *3*, *11*, *12*); knives (n=2, or 3.9%) (see Fig. 9, *8*; 10, *4*); retouched blades (n=18, or 35.3%); a burin (1.9%) (see Fig. 10, *5*); combination tools (n=5, or 9.8%) (see Fig. 10, *6*); and points (n=3, or 5.8%) (see Fig. 10, *13*).

The study area includes a portion of Upper Paleolithic Occupation Horizon 5. Comparisons of these data with analogous indices of the entire technocomplex from Upper Paleolithic Occupation Horizon 5 (Derevianko et al., 1998) allows us to propose a specific function for this study area; intensive hide processing. In contract, the entire artifact collection from Occupation Horizon 5 produced considerably different indices: the proportion of tools in Horizon 5 equals 13.6% of the total number of artifacts; the proportion of retouched blades is 14.8% of the total tools, the fraction of notch-denticulate tools is 25.3%; knives constitute 10.4%; the proportion of *grattoirs* is 9.8%, and that of burins is 14.9%. The apparent predominance of *grattoirs*, which represent an all-purpose tool type in the Kara-Bom technocomplex of retouched blades and notch-denticulate tools, is noteworthy.

Additional information is provided by the patterned spatial distribution of major artifact types in quadrants И, К/7 – 9. A total of 41 tools were clustered around the hearth. The largest cluster of artifacts extends north from the hearth and includes a large number of finds; nine

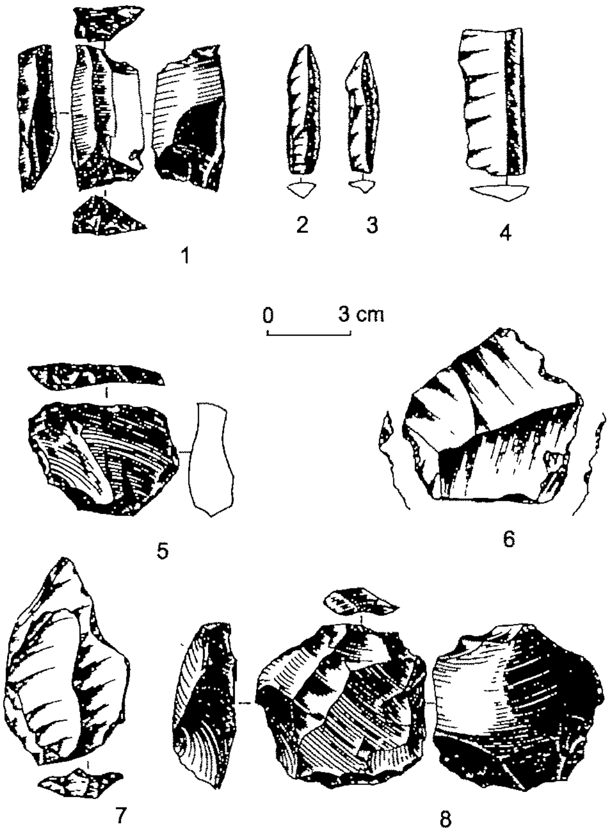

Fig 11. Lithic artifacts from quadrants Л/8 – 9 at Kara-Bom.

of the eleven *grattoirs* in this technocomplex, and the majority of retouched blades.

The spatial distribution of artifacts recovered in quadrants Л/8 – 9 (see Fig. 7, 8) is noteworthy. Rocks located in surrounding quadrants form a sort of walls for quadrants Л/8 – 9: quadrant Л/7 revealed a ledge of bedrock; and quadrant Л/9 a large block of schist, with artifacts found in this peculiar niche. The finds were recovered from levels varying from –316 to –322 cm below zero datum. In addition, an artifact was recovered from the edge of a ledge in quadrant Л/8–300 cm below datum. This artifact was apparently squeezed out in the course of sediment movement. Quadrant Л/9 revealed several artifacts covered by a schist slab at levels from –327cm to –338 cm. A hollow depression 30 x 20 cm filled with granules and powder of a reddish-brown mineral was noted in quadrant Л/8. No other pigments were found in this stratigraphic level. Two lithic artifacts (a retouched flake and a backed blade fragment) together with a flat elongated pebble with one end exhibiting intensive red pigmentation, were recovered from this hollow depression (its maximum depth was established at 331 cm). This depression also yielded two bone pendants: one made of a bone fragment shows red pigmentation, and the other is an ungulate tooth with a perforated root that had decomposed into several fragments post-depositionally. One additional pendant with a drilled perforation made on a fragment of tabular bone was recovered 50 cm from the border of the depression. The total collection of lithic artifacts, mostly débitage, is smaller than in collections recovered in association with other study areas. The lithic collection associated with quadrants Л/8 – 9 comprises 22 stone artifacts including two cores (Fig. 11, *1*, *8*). A total of 12 tools were identified, which constitutes about 55% of the total artifact collection. Within the tool kit, three retouched flakes, two blades retouched along their lateral sides, two carinated end-scrapers (Fig. 11, *5*), two notch-denticulate tools (Fig. 11, *6*); two notched tools (one fashioned on a spall reminiscent of a Levallois point with a faceted striking platform (Fig. 11, *7*); the other notch was made on a blade (Fig. 11, *4*)), and a combination tool (a knife fashioned on an *éclat débordant* with a retouched notch on the cutting edge) have been identified. A core from which small blades were removed (Fig. 12) was recovered from quadrant Л/9. This nucleus is noteworthy, because its original form has been reconstructed through refitting (see Fig. 11, *1*; refitting scheme shown in Fig. 8). It was fashioned on a fragmented massive *éclat débordant*. The core bears double platforms, and flaking was executed from its narrow face. Three small blades were refitted (see Fig. 11, *2*, *3*). Cores of analogous forms bearing signs of similar reduction patterns and relevant spalls are numerous in the technocomplexes from Occupation Horizons 6 and 5 (Derevianko, Petrin, Rybin, 2000; Fig. 9, 10)

The morphology and technology of ornament manufacturing

Ornamental pieces were recovered from the depression in quadrant Л/8 in association with reddish-brown concretions and powder (the total weight is 88 g). N.A. Kulik has identified this pigment as goethite (Fig. 13). This mineral, named after the German poet, Goethe, belongs to the group of ferrous water oxides (FeO(OH), density 4.1, hardness 6) (Rozanov, Tolstikhina, 1947). This mineral usually occurs in boggy environments. Goethite occurs in a variety of colors ranging from yellow to brown, typical of many organic pigments. Goethite can be regarded as a chromoform of natural pigments, like ocher, sienna, and umber. Different sorts of ocher: clay ocher, ferrous oxide ocher, and carbonaceous ocher, are distinguished with respect to the substrate containing goethite as a pigment component. This mineral represents a traditional component (together with another important organic component:

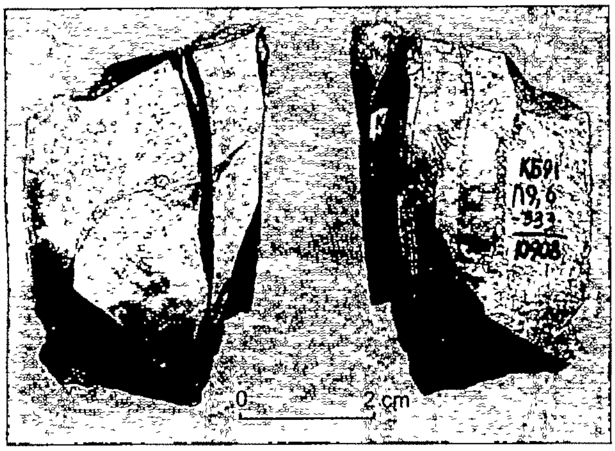

Fig 12. Refitted core from quadrant Л/9 at Kara-Bom

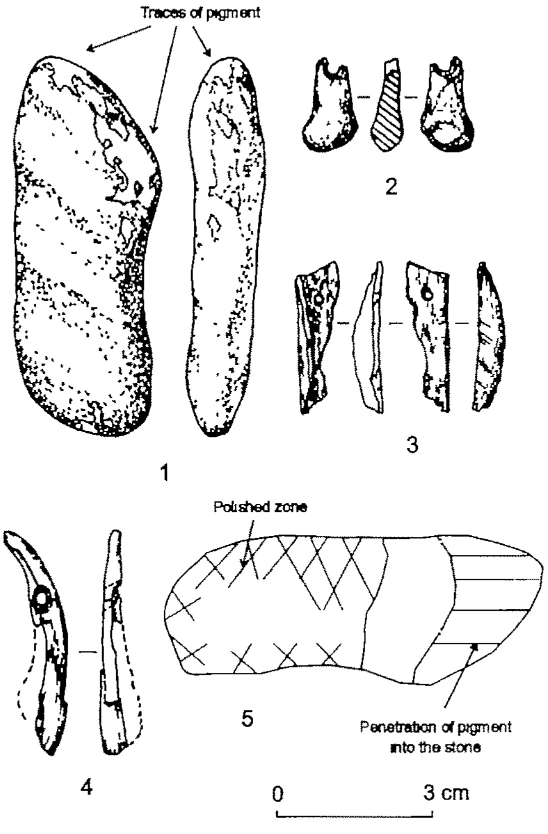

Fig. 14. Implements from quadrant Л/8 (*1* – *4*) at Kara-Bom, location of use-wear zones on the surface of the pebble recovered from the area of pigmented soil (*5*).
1 – pebble, *2* – pendant 1, *3* – pendant 3, *4* – pendant 2.
1 – *4* – drawings by A V. Abdulmanova; *5* – drawing by V P Volkov

fat) for manufacturing ocher, one of the most widespread pigments in Paleolithic culture. Goethite, being a material with a rather high hardness index on Mohs' scale, must be ground in order to produce pigment.

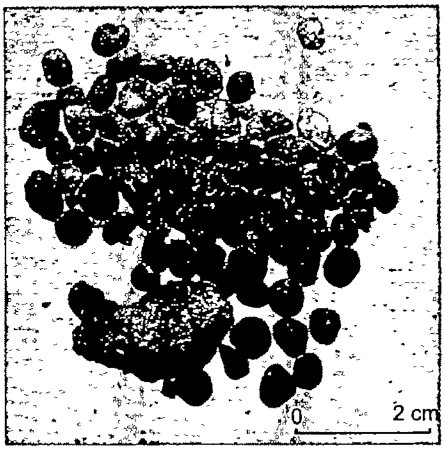

Fig 13. Pieces of mineral pigment from quadrant Л/8 at Kara-Bom.

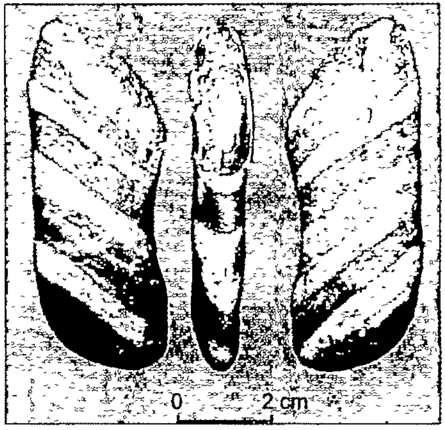

Fig 15. Pebble recovered from the area of pigmented soil at Kara-Bom.

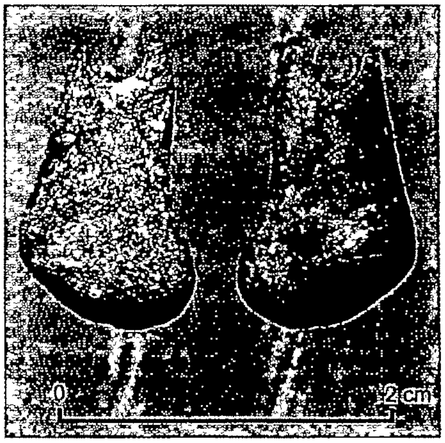

Fig. 16 Pendant 1 from Kara-Bom.

A long, flat, trapezoidal pebble was recovered from a spot of pigment-containing soil. Its maximum length is 74 mm, medial width is 26 mm, and medial thickness is 12 mm This pebble of sedimentary rock has a

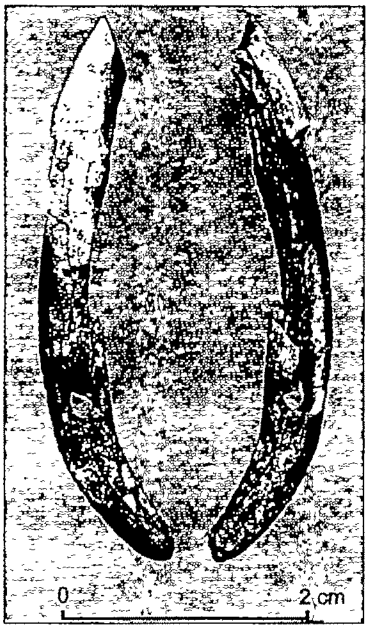

Fig 17. Pendant 2 from Kara-Bom.

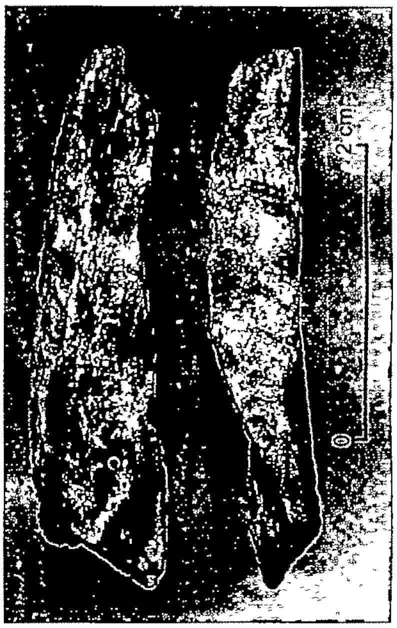

Fig 18. Pendant 3 from Kara-Bom.

smooth surface, with greenish and white veins of aleurolite and sandstone (Fig. 14, *1*; 15). One of the ends of the pebble preserves pigmentation.

As was mentioned above, two pendants were uncovered in association with this spot of pigmented soil.

Pendant 1 has an elongated form and a light reddish-brown color. The shape of the end opposing the eye is reminiscent of a pear. The dimensions of this artifact are as follows: total length, 18 mm; width of the eyed end, 7 mm, thickness, 2.5 mm. At its base, the width is 11 mm and the thickness is 5.5 mm (see Fig. 14, *2*; 16). The tip of the eyed end is missing. Perforation was executed through bi-conical drilling. The pendant was made on a fragment of indeterminate mammalian bone, possibly the metapodial of a small carnivore. The surface of this pendant shows signs of polishing, probably with ocher. The morphology and possibly the technology of working (e.g., utilizing ocher abrasive as a polishing agent, cutting the pendant as a blank) is reminiscent of basket-shaped beads characteristic of Aurignacian Europe (however, in the Aurignacian of southwestern France, such beads were made of mammoth tusk and perforations were made through cutting or gouging; see (White, 1989, 1993)).

Pendant 2 was made from a bovid tooth (identified by S.K. Vasiliev; see Fig. 14, *4*; 17). This pendant was found fragmented into three pieces. Its reconstructed total length is 42 mm; its width and thickness are both 5 mm. The root of the tooth shows a relatively large eye produced by bi-conical drilling.

Pendant 3, recovered outside of the area of pigmented soil, was made from the radius (?) of a small ungulate (?). This elongated rectangular artifact is 34 mm long and 8 mm wide (see Fig. 14, *3*; 18). At one end of this pendant, a bi-conically drilled perforation was made. One of the surfaces of this object bears a series of parallel cut marks.

P.V. Volkov remarks (personal communication) that all three pendants are in a poor state of preservation, and the linear marks are discontinuous. Analysis of use-wear signs has shown that drilling was executed from both surfaces with the aid of a bow-drill. The axis of drilling is not precisely perpendicular with the surface; the points of drilling on the opposing surfaces do not exactly coincide. The drill was revolved to more than 180° and drilling was probably executed with a lithic tool which was not specially prepared for this operation. Prior to drilling, the bone surface of the pendant blank was prepared by flattening, probably with a knife, through unidirectional movement, and resulting chips were cut out transversely. Cut marks on Pendant 3 were made with a knife (not a burin) with a narrow, unretouched cutting edge.

According to Volkov, the pebble demonstrates a good state of surface preservation. Micro-polish and linear use-wear signs were identified on its surface. Two areas exhibiting considerable use-wear damage were also identified (see Fig. 14, *5*). One area has been delineated on the posterior surface of the pebble, where it was held by the operator. It demonstrates micro-polish signs resulting from contact with the operator's hands. Another area has been identified as a working area, suggested by the presence of irregular linear use-wear signs with traces of ocher. Functionally, the pebble can be identified as a palette knife for applying viscous ocher. The micropores on the surface of the pebble contain ocher fragments and the use-wear traces suggest short-term usage of this instrument, i.e., a "single-operation" tool.

The archaeological context of ornaments

The study area under discussion revealed a complex pattern of dispersal of artifacts and premeditated constructions. The eastern part of the area revealed a spot of burned soil. Remains of a hearth (probably with pavement) were found in the center of the study area. The hearth was constructed in an artificial hollow as suggested by micro-stratigraphic data. In the north and east, the area is delimited by large schist blocks and outcrops of bedrock. It cannot be discounted that these rocks represent remains of anthropogenic dwelling constructions. This hypothesis is supported by the specific composition of finds and the pattern of their spatial distribution over the area, which are not typical of a simple workshop: the western portion of the area yielded 16% of the total collection of artifacts recovered from this area, while the central and eastern portions produced 25.7% and more than 50% of artifacts recovered, respectively. The number of cores discovered is small; most are heavily exhausted. The proportion of artifacts bearing natural cortex on their dorsal faces is exceptionally small, only 9.8% of the total number of spalls, while the average proportion of cortex-bearing spalls for the Upper Paleolithic technocomplexes at Kara-Bom is 13 – 17 %. It is interesting that the collection from the Middle Paleolithic Horizon 2 contains 29.8% cortex-bearing spalls, suggesting that primary reduction of nuclei took place outside the study area. The central part of the area surrounding the hearth yielded an unusually high percentage of *grattoirs*, retouched blades, and unretouched large blades bearing use-wear signs, as well as a few cores and products of primary reduction. Apparently, the area surrounding the hearth represents an animal butchering and hide processing zone. Primary reduction may have been executed outside the study area. As was stated above, the Kara-Bom site represents an economic activity zone during the early Upper Paleolithic due to its beneficial geographical setting (Derevianko et al., 1998; Rybin, 2002). The site is located to provide an unobstructed view over the valley. At a distance of 300 m from the site, the valley narrows and the mountains form a semicircular ridge (see Fig. 2). A path leading through this semicircular ridge connects the Yelo Basin with a neighboring waterless valley; thus, this pass may have been used by animals accessing watering spots. The site seems convenient for human hunters. Raw material was brought to this beneficially located site (fresh water availability, southern exposure, protection from prevailing wind) from distances of 4 – 5 km for utilization in hunting game*.

The analysis of use-wear traces on the Kara-Bom artifacts allows us to infer regular butchering activity at the site. This hypothesis is supported by the fact that the proportion of knives in Upper Paleolithic Occupation Horizon 5 constitutes 68 2% of the tool collection. Within the category of knives, the percentage of medium to heavily worn instruments is 78.3%. Another characteristic feature of the artifact collection from Upper Paleolithic Occupation Horizon 5 is a considerably high percentage of *grattoirs* (25%) used in skin processing (Volkov, 1998). In addition, the state of bone preservation (many consist of only small fragments with signs of burning), suggests that at least some game was consumed at the site.

The series of presumed cult objects recovered from quadrant Л/8 seems to have also been related to hunting. This inference is based on the following facts. These were recovered from a peripheral zone, unconnected with other activity areas. This peripheral zone yielded considerably fewer artifacts. Spalls struck from a split core were scattered over an area of 1 m suggesting they were not taken far away from the spot. Ornaments were concentrated in a small oval-shaped hollow (with a depth of about 10 cm) forming a homogenous complex. The pebble recovered in association with goethite is thought to have been used for grinding minerals and soft organic matter in other words in the production of pigments. The pebble likely attracted attention due to its convenient shape and distinctive striped coloration. Pendants 1 and 2 are broken, possibly intentionally with the purpose of symbolic "killing" of the objects. Ocher was used as an abrasive and probably also as a dye in manufacturing of pendant 1. On the basis of these facts, deposition of these artifacts in the hollow may be interpreted as a symbolic sacrifice or as a hoard. These objects may be regarded as a portable cult assemblage (consisting of pigment, a grinding stone, and ornaments), that may have been kept in a sack that was left on the spot for some reason. Pendant 3, which was found 0.5 m away from the hollow, is apparently related to this cult set. The purpose of the noted parallel cut marks is unclear: whether they are decorative motifs or merely traces left in the process of manufacturing is unclear, but the former interpretation seems more reliable, because the purely technological expediency of these marks is not clear.

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* N.A. Kulik has noted that natural cortex of artifacts recovered from the Upper Paleolithic occupation horizons at Kara-Bom does not bear signs of long-term exposure to flowing water, consequently, raw material was imported from outcrops of effusive rocks

Ornaments and symbolic behavior in the early Upper Paleolithic of South Siberia

Numerous publications have been dedicated to the description of non-utilitarian implements associated with the South Siberian Paleolithic (Arkheologia i paleoecologia..., 1990; Arkheologia, geologia..., 1998; Derevianko, 2001; Derevianko et al., 1998; Derevianko et al., 2000; Konstantinov, 1994; Vasiliev, Kuznetsov, Mesherin, 1987; Lbova, 2000, 2002; Lbova, Volkov, Bazarov, 2002; Rudenko, 1960; Tashak, 2000, 2002a, b; Goebel, Aksenov, 1995; Goebel, Waters, 2000)*. Regrettably, these publications do not always contain precise information on the stratigraphic context and distribution of ornaments as well as their typology and exact quantity. Chronological estimates of the age of these sites are often characterized by great discrepancies. However, the information available allows us to make certain inferences. Nine archaeological sites in the Altai Mountains have been attributed to the early Upper Paleolithic. Five sites have yielded ornamental objects in archaeological context. The most numerous and variable set of non-utilitarian objects has been recovered from Denisova Cave Stratum 11 (see Table) (Arkheologia, geologia..., 1998; Derevianko, 2001). Stratum 11 yielded 31 non-utilitarian objects in association with an early Upper Paleolithic industry. These objects may be classified as ornamental pieces**. This series of ornaments includes nine pendants made of animal teeth with bi-conically drilled holes in their roots (fox canines, canine and incisor teeth of deer, and a bison incisor; see Fig. 19, *5, 7, 11*); eight conical beads made of tubular bones (Fig. 19, *1, 3*), some bearing annular incisions; a ring fragment made of mammoth tusk; bone fragments with bi-conically drilled holes; three pendants and two beads made of stone (Fig. 19, *8, 10, 13, 14*). In addition, two objects have been identified as bead blanks (Fig. 19, *2, 4*). One of these objects is a small piece of mammoth tusk with two drilled holes and a narrow medial portion. This artifact is typologically similar to ornamental pieces of mammoth tusk reported from Aurignacian strata IIa – IIb at Geissenklösterle (Germany), dating to 36 – 32 ka (Hahn, 1996). Such analogues noted between artifacts from sites located far away from one another hardly suggest any cultural affiliation. However, they are suggestive of a similar cultural-chronological background for such specific implements.

The sediments overlying Stratum 11 at Denisova Cave produced an AMS date on charcoal of 29,200 ± 360 BP (AA-35321) (Derevianko et al., 2000). A conventional infinite ^{14}C date of >37 ka has been generated on bone recovered from the middle portion of Stratum 11 (Arkheologia, geologia..., 1998). These non-utilitarian objects from Stratum 11 represent a series of ornaments suggestive of a developed technology and typology for production of items of personal adornment. The currently available objects form stylistically homogenous sets, which indicate a consistent system of manufacturing and secondary treatment. Ornaments from Occupation Horizon 5 at Kara-Bom are generally similar to the pendants made of animal teeth and bones from Stratum 11 at Denisova Cave, though the former are less accurately worked (see Fig. 19, *5, 7, 11, 12*). All objects demonstrate one technique of bi-conical drilling; holes were manufactured at the same location on tooth roots.

Few other ornamental pieces have been reported from the Altai Mountains. Startum 9 at Ust-Karakol has yielded a fragment of a serpentine implement with a bi-conical hole (Arkheologia, geologia..., 1998, see Fig. 19, *9*). A pendant reported from Maloyalomanskaya Cave is noteworthy due to its precise secondary working. This pendant is fashioned from the canine tooth of a red deer bearing a bi-conically drilled hole and eleven parallel incisions This pendant was recovered in association with a stone bearing ocher pigmentation on its surface (Fig. 20) (Arkheologia i paleoecologia..., 1990) and is virtually identical to the ornamental object recovered from the pit in Stratum 11 at Denisova Cave (cf. Fig. 19, *6*). A pendant from Ust-Kanskaya Cave (Fig. 21) (Rudenko, 1960, 1961) exhibits two holes, the same as the Denisova Cave ornament. It bears incised marks at its edges and its surface is polished. The Ust-Kanskaya pendant is also very similar to other Early Aurignacian ornaments in Europe. The Ust-Kanskaya pendant was found by Sergei Rudenko in 1954 during the course of excavations that were carried out without adequate control of the stratigraphic provenience of artifacts. The exact location of the pendant within the profile is unknown, however the conventional attribution of this object to the early Upper Paleolithic seems correct.

Thus, the period from 43 to 37 ka BP brackets the appearance of ornaments in the Altai Mountains. Ornaments are associated with blade-based industries of the early Upper Paleolithic that developed out of the local variant of the Middle Paleolithic industry (Derevianko, 2001). The most variable and numerous series of non-utilitarian objects have been reported from Denisova Cave. This site has been classified as a permanent occupation site on the basis of its distinctive

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* See also. Shunkov M.V. *Arkheologia i geografia paleolita Severo-Zapadnogo Altaia*. Dr. Sc. (History) Dissertation (manuscript).

** Objects that have been recovered from the fill of two anthropogenic pits were not included in the ornament collection from Stratum 11, because they probably derive from Stratum 9 (Arkheologia, geologia .., 1998).

Ornaments from Paleolithic sites of South Siberia and their archaeological contexts

Site	Layer	^{14}C date, BP	Cultural attribution	Site use	Occurrence of pigment in the layer	Type of ornament
			Gorny Altai			
Kara-Bom	Occupation Horizon 5	43,300 ± 1600 (GX-17596)	Initial stage of EUP, blade-based industries	Seasonal hunting camp	+	Bone pendants (n=3)
Denisova Cave	Stratum 11	> 37,235 (SOAN-2504)	Initial stage of EUP*, blade-based industries	Long-term occupation site	–	Bone pendants, beads, cylinder beads, bone with signs of drilling, stone pendants (n=31)
Maloyalo-manskaya Cave	Stratum 3	33,350 ± 1145 (SOAN-2550)	EUP, blade-based industries of the Kara-Bom type	Short-term hunting camp	+	Pendant (tooth of *Servidae*)
Ust-Karakol	Stratum 9	33,400 ± 1285 (SOAN-3257) 29,860 ± 355 (SOAN-3358)	EUP, blade-based industries	Seasonal hunting camp	–	Stone with signs of bi-conical drilling
Ust-Kanskaya Cave	?	–	EUP(?)	Seasonal hunting camp	–	Bone pendant
			Trans-Baikal			
Podzvonkaya	East Complex Southeast Complex Lower Complex	22,675 ± 265 (SOAN-3350) 38,900 ± 3300 (AA-26741) > 36,800 (AA-26742) 35,180 ± 1100 (SOAN-4122) 43,900 ± 960 (SOAN-4445)	Initial stage of EUP blade-based industries	Long-term occupation site	+	Pendants of ostrich eggshell (15 complete and fragmented pieces), bone and stone pendants Pigment on ornament surfaces
Khotyk	Layer 2 Layer 3	26,220 ± 550 (AA-3269) –	EUP, blade-based industries of the Kara-Bom type	Seasonal hunting camp	+	Bone and stone pendants, rings, cylindrical beads Pigment on ornament surfaces
Kamenka	Complex A	30,220 ± 270 (SOAN-3354) 31,060 ± 530 (SOAN-3052) 35,845 ± 695 (SOAN-2904) 40,500 ± 3800 (AA-26743)	EUP, blade-based industries of the Kara-Bom type	Seasonal hunting camp	+	Complete and fragmented cylindrical beads (*Aves* bones), disc fragments (n=7), objects with perforations and cut marks Pigment on ornament surfaces
Tolbaga	Stratum 4 4	34,860 ± 2100 (SOAN-1522) 27,210 ± 300 (SOAN-1523) 29,200 ± 1000 (AA-26740) 25,200 ± 260 (AA-8874)	EUP, blade-based industries	Long-term occupation site	–	Bone objects with perforations (n=2)
Varvarina Gora	Layer 2 (?)	29,895 ± 1790 (SOAN-3054) 30,600 ± 500 (SOAN-850) 34,050 (AA-8875) 35,300 (AA-8893)	EUP, blade-based industries	Long-term occupation site	+	Stone bead, a stone disc fragment with pigment on the surface, polished implement with bi-conical hole

* EUP – early Upper Paleolithic

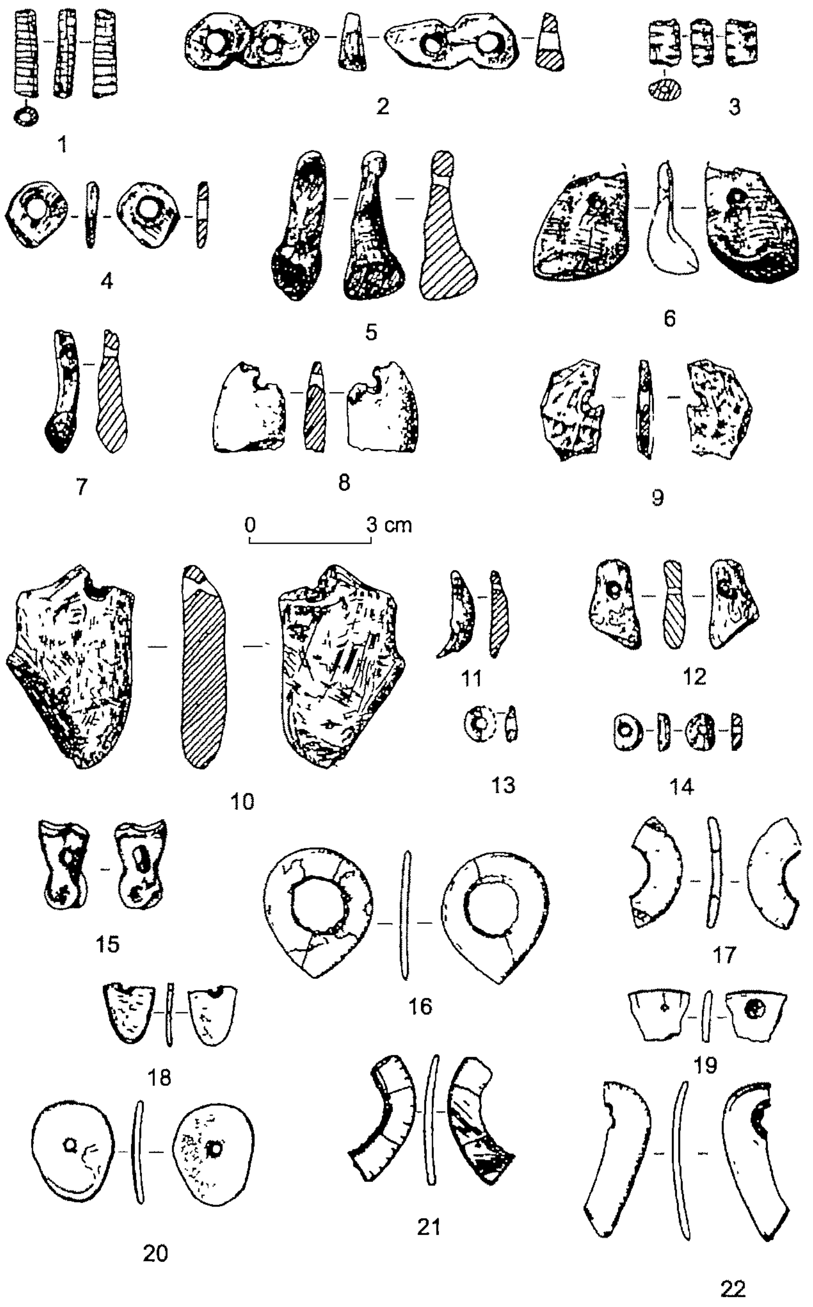

Fig 19. Non-utilitarian objects from early Upper Paleolithic technocomplexes of the Altai and Trans-Baikal (after (Arkheologia, geologia . , 1998; Tashak, 2002a)).
1 – 8, 10 – 14 – Denisova Cave, stratum 11, *9* – Ust-Karakol, stratum 9, *15 – 22* – Podzvonkaya
1 – 7, 11, 12, 15 – bone, *8 – 10, 13, 14* – stone, *16 – 22* – ostrich eggshell

functional-economic features. Other ornaments were recovered from contexts currently interpreted as seasonal and short-term occupation sites. Although the presumed intensiveness of repeated occupation is variable, its general characteristic as a locus of regular, short-term occupation by Paleolithic humans seems certain (Derevianko, Shunkov, 2002). Evidence of the occurrence of natural pigments has been reported only from Kara-Bom and Maloyalomanskaya Cave. Kara-Bom is the only site where ornaments were recovered in immediate association with the household economic objects within a cultural context.

Early Upper Paleolithic industries have also been identified in the Trans-Baikal area. Trans-Baikal multi-layered sites are dated through radiocarbon assay to 40 to 26 ka BP. In the early Upper Paleolithic of the

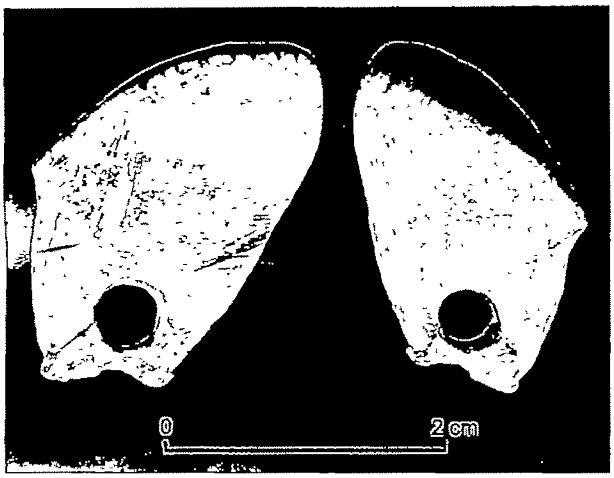

Fig. 20. Pendant from Maloyalomanskaya Cave.

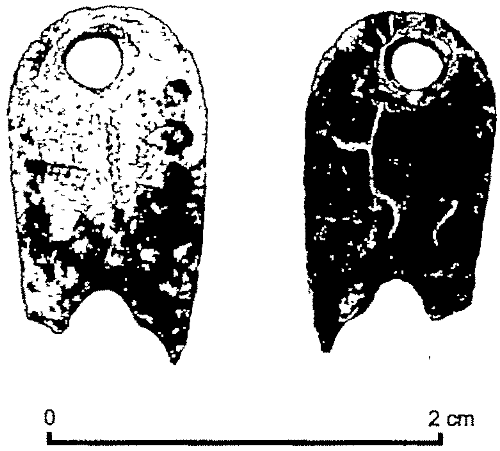

Fig 21. Pendant from Ust-Kanskaya Cave (photo by A V. Postnov).

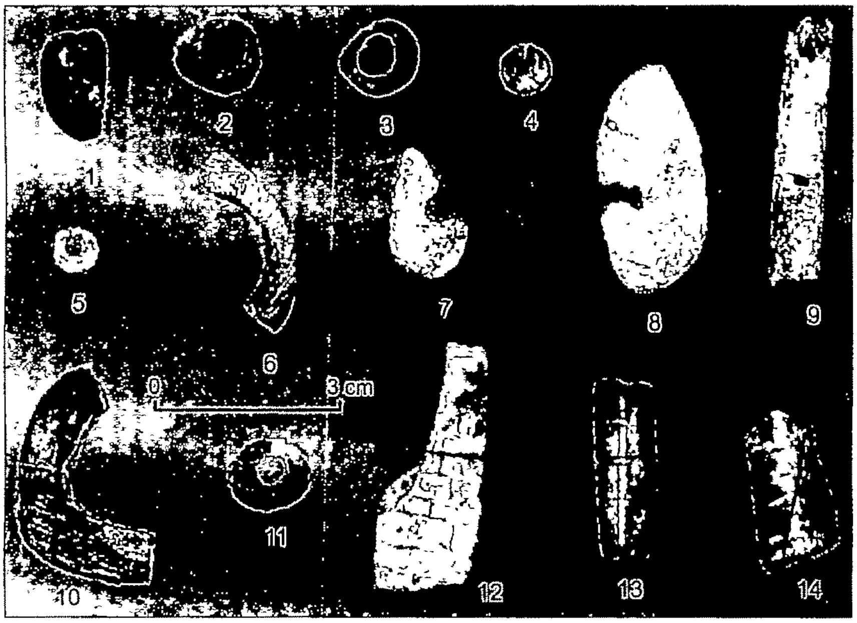

Fig. 22. Non-utilitarian objects from early Upper Paleolithic technocomplexes of Trans-Baikal (photo by L.V. Lbova).
1, 5 – 11 – Khotyk, *2 – 4, 12 – 14* – Kamenka.

Trans-Baikal, two technological trends have been identified: a "flake-based" aspect illustrated by materials from the Kunalei and Kamenka B sites; and a "blade-based" variant, which demonstrates close similarity to the Altai technocomplexes (Konstantinov, 1994; Lbova, 2000). However, clear "transitional" industries have not yet been identified in the Trans-Baikal. All the Trans-Baikal "blade-based" industries represent typical Upper Paleolithic technocomplexes. Ornaments have been associated with strata containing such Upper Paleolithic industries.

Presumably, the earliest known ornaments have been reported from the Podzvonkaya settlement site (Tashak, 2000, 2002a, b). The excavation area at the site occupies several thousand square meters. In the course of excavations, several distinct units have been identified on the basis of stratigraphic features and spatial distribution of artifacts. Investigations at the site have not been completed, and the scanty archaeological data that have been published thus far do not provide full information on the complex stratigraphic situation and artifact distribution patterns at the site located in geological contexts of slope deposits and redeposition.

The earliest archaeological remains were recovered from the Lower Unit. Although, geological layers forming this unit were redeposited and partially washed out, a bone sample was taken from a layer bearing bone remains and Iron Age artifacts A conventional radiocarbon date of ca 44 ka BP (Tashak, 2002b) has been generated on this sample. The layer also yielded a pendant made of ostrich eggshell (see Fig. 19, *15*), and spots of ocher pigmentation*. The majority of ornaments were recovered from the eastern and southeastern units, for which ^{14}C dates of 38 through 35 ka BP are available (Tashak, 2000). A total of fourteen ostrich eggshell pendants (complete and fragmented) were recovered from these units (see Fig. 19, *16 – 22*) as well as a stone pendant and a perforated mammal phalanx (see Fig. 19, *15*). Perforations were produced through conical drilling. Shell pendants show traces of polish and cut marks along their edges. About one third of the pendants retain traces of ocher, and some pendants were found near hearths** (see, e.g., Fig. 19, *21*).

Numerous non-utilitarian objects were also reported from the Kamenka A site, near Ulan Ude. Available radiocarbon dates are clustered around two chronological periods – ca 31 ka and 40 – 35 ka BP (Lbova, 2002). This site has been identified as a seasonal hunting camp. Kamenka A has yielded 37 non-utilitarian objects (Fig. 22, *2 – 4, 12 – 14*; Lbova, 2000). The items of personal adornment include tubular beads made of bird bones. Some pendants bear parallel incisions. Also a possible bracelet fragment made of mammoth bone and four indeterminate bone fragments with cut marks and perforations (one bone fragment bears ocher pigmentation) have been recovered. Some artifacts mentioned here were found in two clusters of non-utilitarian objects (Ibid.: 46).

In the Trans-Baikal, personal adornments have also been reported from the Khotyk site. The Khotyk technocomplex associated with culture-bearing Horizons 2 through 4 shows close similarity with the Upper Paleolithic technocomplexes of Kara-Bom. Regrettably, no reliable age estimates for Cultural Horizons 3 through 5 at Khotyk have been established. Cultural Horizon 2 has yielded a radiocarbon date of 26 ka BP. The Khotyk sediments were also dated through radiothermoluminescence (RTL), but the specific RTL technique employed is not described in the original publication and yields low-precision dates ranging between 56 – 28 ka BP (culture-bearing Horizon 2); 34 – 26 ka BP for Horizon 3 (the former date is related to culture-bearing Horizon 3 in the text (Ibid.: fig. 4), while in Table 16 in the same publication, this date is associated with Horizon 2). The underlying culture-bearing Horizon 4 has yielded dates ranging between 91 – 65 ka BP . However, the principal excavator of Khotyk considers dates in the range 40 – 30 ka the most reliable for Cultural Horizon 3 and probably for culture-bearing Horizon 4 as well (Lbova, 2002). Available archaeological evidence suggests functional identification of Khotyk as a seasonal hunting camp, similar to Kamenka A. Skeletal remains of gazelle (*Procapra gutturosa*) and horse (*Equus caballus*) constitute about 75% of the established MNI (minimum number of individuals), the majority of bones deriving from females and young animals (Lbova, 1999; Klementiev, 2001). Ornaments have been recovered in association with culture-bearing Horizons 2 and 3, including bone pendants, cylindrical beads, and discs (however, information regarding their exact number and spatial distribution has not been provided). Horizon 3 yielded non-utilitarian objects in association with soil stains of various colors: green, red, white, black, and yellow (Lbova, 2000: 107; Lbova, Volkov, Bazarov, 2002). A total of seven non-utilitarian objects have been identified (Fig. 22, *1, 5 – 11*) including ovoid pendants made of polished pebbles, globular beads with holes in their centers, and fragments of large circular and sub-triangular lithic implements with large holes, reminiscent of "Neolithic rings" (Lbova, Volkov, Bazarov, 2002).

Solitary ornaments have been reported from other archaeological sites in the Trans-Baikal. In the course of excavations at Varvarina Gora carried out by Okladnikov in 1973 – 1974 in the vicinity of Khotyk, a few non-utilitarian objects were found including a small ring or bead of stone, a semi-lunar disc of stone with remains of ocher pigmentation on its surface, and an object of white stone with a bi-conical perforation (Okladnikov, Kirillov, 1980; Lbova, 2000). Their stratigraphic position is not clear; most probably they belong to Cultural Horizon 2, dated to ca 34 ka BP (Goebel, Aksenov, 1995; Lbova, 2000).

The Tolbaga site, Layer 4 yielded several radiocarbon dates ranging between 35 – 25 ka BP, the majority falling around 25 ka BP, including two recently generated AMS dates (Konstantinov, 1994; Goebel, Waters, 2000). The discrepancy in the chronological estimates for the Tolbaga sediments may suggest that Tolbaga belongs to the latest early Upper Paleolithic. On the other hand, the exposed area of Stratum 4 at Tolbaga is relatively large and revealed complex dwelling constructions and abundant lithic artifacts. These facts allow its identification as a palimpsest of features resulting from repeated human occupation over a long period occurring within a single stratigraphic unit. Given these suppositions, the precise chronological attribution of two bone implements with signs of artificial perforation from Stratum 4 at Tolbaga (Vasiliev, Kuznetsov, Mesherin, 1987) is hardly possible.

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* Tashak, personal communication.

** Tashak, personal communication.

Such a cursory review of data on the occurrence of objects of personal adornment in early Upper Paleolithic sites in the Trans-Baikal shows that none of the technocomplexes yielding non-utilitarian artifacts can be dated prior to 40,000 years ago. Probable personal adornments appear in the earliest blade-based industries with a characteristic set of artifacts. This fact suggests socially and spiritually developed human communities Trans-Baikal artisans produced adornments in a variety of materials, unlike the Altai population. "Trans-Baikalians" employed various techniques of raw material working including sawing, drilling (unlike the Altai population, the Trans-Baikal people performed bi-conical as well as other types of perforations), polishing of bone, stone, and such "exotic" raw materials as ostrich egg shell. Virtually all adornments were recovered from archaeological contexts interpreted as long-term occupation sites, or sites of repeated short-term occupation, and which revealed distinct dwelling structures: living zones, refuse pits, hearths (according to the principal investigators' interpretations).

In Trans-Baikal sites, the association of objects of adornment with such structural elements as hearths (Podzvonkaya) is more pronounced than in the Altai At Kamenka and Khotyk, adornments were found close to one another. It is noteworthy that at four of the five above-mentioned Trans-Baikal sites, adornments were found in association with spots of pigmented soil and some items bore traces of pigment on their surfaces. All these features were noted in the Kara-Bom symbolic set recovered from Occupation Horizon 5.

The features characterizing manufacture and use of personal adornments noted in the Altai differ from those in the Trans-Baikal. This can be explained by the comparatively early onset of the Upper Paleolithic in the Altai and the absence of transitional industries in the Trans-Baikal. Differences in behavioral strategies may also provide an additional explanation for this pattern. In the Altai, human populations exploited relatively small territories during both the Middle and early Upper Paleolithic. The basis for this hypothesis lies in the fact that most sites demonstrate the predominant employment of local raw materials without respect to its quality. Such a limited mobility pattern may be the result of an adaptation by Paleolithic humans to a low montane environment, which sustained human subsistence without extensive resource exploitation strategies. The life in constrained valleys and intermontane basins with their predictable resources and relatively dense biomass did not require highly mobile human populations. Animal remains reported from Altai archaeological sites have not shown any preference in prey choice. A certain extension of exploited territories noted in the early Upper Paleolithic (suggested by sporadic transportation of raw material from places situated at distances of 60 – 80 km from Kara-Bom and Denisova Cave (Postnov, Anoikin, Kulik, 2000; Rybin, 2002)) as well as an increase in the number of sites dating from this period, was probably caused by an increase in the density of human populations and the development of social relationships among human communities as is suggested by the general occurrence of socially meaningful objects of personal adornment.

The Trans-Baikal materials suggest more precise behavioral functions of archaeological sites: seasonal hunting camps and large long-term occupation sites with clear dwelling structures. Such differentiation in the functions of sites may have been the result of a migratory mode of life. Life in the Trans-Baikal required a more extensive subsistence strategy than in the Altai because of the more severe and less varied and predictable environmental conditions in the region. Archaeological collections reported from the Trans-Baikal (e.g., Kamenka and Varvarina Gora) are generally based on raw materials imported from distances of about 40 km (Lbova, 2000: 80), suggesting the considerable expansion of exploited territories. Faunal collections from western Trans-Baikal include only remains of steppe and mountain-steppe species. Available data suggest hunters preferentially pursued gregarious animal species. This phenomenon suggests the adaptation of human communities to open spaces characteristic of semi-arid steppe zones.

Conclusions

The Middle to Upper Paleolithic transition occurred approximately at the same time in the Altai and in western Eurasia. Available archaeological materials demonstrate similarities in technological changes (see discussions in the 2001 and 2002 issues of this *Journal*). The present paper attempts to establish the ways in which symbolic behavior were manifest in the major centers of the Upper Paleolithic, in the Altai in particular, and seeks to provide Eurasian cross-cultural analysis of characteristic features of human symbolic behavior.

In the Near East, the earliest non-utilitarian objects have been reported from the caves of Üçağızlı, Turkey and K'sar-Akil, Lebanon (Kuhn et al., 2001). Layers G and H at Üçağızlı yielded numerous beads and pendants made of marine mollusk shell in association with an early Upper Paleolithic lithic industry. Four radiocarbon dates ranging between 41 – 39 ka BP have been generated for these layers.

Similar implements were reported from Layer 21 at K'sar-Akil Cave (dating to ca 43 ka BP) in the Levant. Two pendants made of perforated wolf and fox teeth were recovered in association with a transitional "proto-Aurignacian" industry from Layer 11 at Bacho Kiro Cave, Bulgaria, associated with an infinite conventional radiocarbon date of >43 ka BP (Excavation..., 1982), and a series of AMS dates ranging between 38 – 33 ka (Hedges et al., 1994). A series of non-utilitarian objects including perforated canine teeth of arctic fox and stone pendants (about 50 items in total) was recovered from Stratum II at Kostenki-17 dated to ca 36 ka BP (Sinitsyn et al., 1997). Ornaments recovered from Strata VIII – X at the Grotte du Renne in Arcy-sur-Cure, France, dated in the range of 45 to 32 ka, have generated considerable debate. This site has yielded pendants, beads, and rings made of mammoth tusk (d'Errico et al., 1998; Zilhão, d'Errico, 1999; Mellars, 1999). The debate focuses on the question of whether Neanderthals were capable of complex symbolic behavior independently of anatomically modern humans and, if Neanderthals were the bearers of Chatelperron and similar industries, who was responsible for the initial appearance of the Upper Paleolithic in Europe? Participants in this debate have achieved consensus that portable art and symbolic behavior appeared in Europe as a result of interactions between representatives of two different anthropological types and the need for individuals and communities to self-identify in the course of conducting increasingly complicated social lives. This inference is important because the question of who was the bearer of early Upper Paleolithic culture and, consequently, who was responsible for the earliest expressions of symbolic behavior in any particular territory is still open, at least in South Siberia.

Hominine teeth recovered in association with Middle Paleolithic technocomplexes in Denisova and Okladnikov Caves in the Altai have been the only paleoathropological materials available thus far in Siberia, which may provide an insight into the identity of the early bearers of Upper Paleolithic culture (Shpakova, Derevianko, 2000, Derevianko, 2001; Shpakova, 2001). Based on available metric parameters, these dental remains have been attributed to archaic *Homo sapiens sapiens* with a high degree of confidence. Notably, non-metric analysis of these teeth reveals a mixture of Western and Eastern traits even in the earliest specimens available. Reconstructions of the sequence of development of Gorny Altai lithic industries have shown a continuous development of local Middle Paleolithic industries into Upper Paleolithic successors. Available anthropological data have provided information, reliable only to a certain extent, on the presumably continuous evolution of human populations in this region throughout the same time period.

However, symbolic behavior is not a universal feature of the Upper Paleolithic. Thus, geometric patterns found on pieces of ocher from Blombos Cave in South Africa were recovered from Middle Paleolithic contexts, presumably left by anatomically modern humans ca 77,000 years ago (Henshilwood et al., 2002). In fact, true "modern behavior" is a complex phenomenon. At Kara-Bom, a suite of four characteristic features of "modern human behavior" was noted in a single archaeological context: (1) a complex system of mobility and raw material transportation stipulating site function as a place of game processing; (2) clear spatial organization patterns of dwelling and activity zones; (3) employment of the Upper Paleolithic technology of wedge-shaped core reduction; and (4) symbolic behavior. The features of cult activities noted presupposes the existence of a portable set of artifacts and their employment in the conscious act of sacrifice/deposition represents unique evidence at such an early stage of the Upper Paleolithic in South Siberia. Apparently, increasing complexification of the social structure of human communities stipulated by reasons as yet unknown (presumably including but not limited to interactions between migrating human communities, ecological, and/or demographic stress) caused the rapid appearance of a new, completely developed, cultural system. Analysis of available data has shown that the appearance of symbolic behavior in South Siberia occurred penecontemporaneously with other locations of dispersal of Paleolithic culture. This process took place at sites yielding blade-based transitional industries, suggesting a striking parallelism in the transition from the Middle to Upper Paleolithic about 50 – 40,000 years ago along the "axis of change" connecting Central Asia – the Near East – and Central and Western Europe.

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PERIODIZATION OF THE UPPER PALEOLITHIC OF SAKHALIN AND HOKKAIDO IN THE LIGHT OF RESEARCH CONDUCTED AT THE OGONKI-5 SITE

History of Paleolithic studies on Sakhalin

Sakhalin and Hokkaido are islands located at the geographical junction of East and Northeast Asia. The history of archaeological investigations'of these territories extends back more than 150 years. Paleolithic studies began more recently, only during the second half of the 20th century. M. Yoshizaki's work on the Yubetsu River in 1952 provided the impetus for the search for Paleolithic sites on Hokkaido. On Sakhalin, Paleolithic studies were initiated by V.V. Viazovskaya from the Museum of Regional Studies In 1964 – 1965, she discovered a microblade assemblage at Imchin-1, near Nogliki (Viazovskaya, 1973). Vasilievskiy (1973a) was the first to demonstrate the importance of the Imchin finds. In 1974, Golubev identified Paleolithic artifacts in the collection brought from the Sokol site by Zaitsev, then an undergraduate student. The study of Sakhalin stone blade complexes were first elaborated by Vasilievskiy (1973a, b), Lavrov (1984), Vasilievskiy and Golubev (1976), and Gorbunov and Gorobets (1989). The monographic study, *Sakhalin in the Stone Age*, (Golubev, Lavrov 1988) was one of the main achievements of this stage of Paleolithic research in the region. The authors assembled all existing information on sites containing blade-based industries that had been accumulated up to the mid-1980s. They identified several Paleolithic cultures and summarized the results of all previous research Several interpretive conclusions were offered, including:

(1) that Sakhalin was first peopled during the Upper Paleolithic, not less than 25,000 years ago, when it was a peninsula connected to the East Asian mainland;

(2) the Pleistocene peopling of this territory proceeded through migration from the north, i.e., the Lower Amur. This caused the development of the so-called pebble tradition, exemplified by the Ado-Tymovo site on central Sakhalin;

(3) the early population of Sakhalin circulated within the limits of the peninsula; this circumstance determined the similarity and synchronicity of the development of cultures based on stone blade industries and the exploitation of obsidian deposits (this conclusion is illustrated by collections from the Sokol and Takoe-2 sites);

(4) approximately 20,000 years ago, the earliest "obsidian way" circulation network was established within the limits of the Sakhalin–Hokkaido Peninsula.

These inferences were of crucial importance and established the foundation for further progress in the study of Paleolithic sites in the insular region However, despite the successful progress of such further research, many sources of data and many previous assumptions concerning the Sakhalin Paleolithic have been subject to severe criticism, the main reason being the acute contradiction between the general level of the above-mentioned studies and their data bases (Gorbunov, 1990; Shubina, 1990). The work of the Lyutoga Paleolithic Expedition of the Yuzhno-Sakhalinsk State Teachers' Training Institute (presently Sakhalin State University) accomplished this aspect of research. In 1992 – 1996, a thorough archaeological survey of Pleistocene terraces on the Lyutoga River was completed. During this project, the methods of prospecting for early sites were elaborated, a series of Upper Paleolithic and Initial Neolithic sites with preserved cultural layers were discovered, and excavations at the Ogonki-5 settlement site were undertaken. For the first time in the history of

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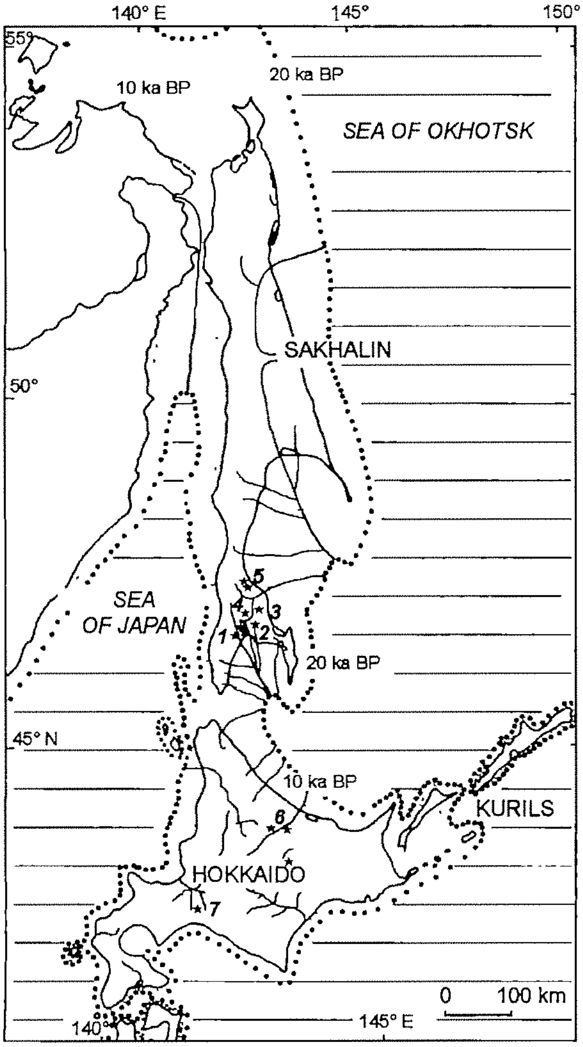

Fig 1 Outline map indicating selected archaeological sites on Sakhalin and Hokkaido Islands dating at 20 – 10 ka BP. *1* – Ogonki-5 – 7, Urozhainoe-3, *2* – Olimpiya; *3* – Sokol, *4* – Chitinka, *5* – Ruchii, Sennaya-1 and 2; *6* – Shirataki group of sites, *7* – Chitose group of sites, including Kashiwadai-1

Sakhalin archaeology, a well-stratified and documented Upper Paleolithic site with a rich cultural layer was studied. Dwellings were investigated and a series of chronometric dates obtained In addition, several other sites of the Sartan period were discovered and partially explored in the southern part of the island. As a result, up to the mid-1990s, the sources of data on the Sakhalin Paleolithic increased and new reliable cultural materials comparable to the world-renowned Paleolithic sites of Hokkaido were obtained. This circumstance makes it possible to carry out accurate comparisons and to discuss problems of the Upper Paleolithic not only within the Sakhalin area but also on a regional level. These are the most essential results of the first stage of research on the Sakhalin Paleolithic.

The discovery of Early and Middle Paleolithic sites in 1998 – 2000 was an important event, signaling the beginning of a new, modern period of the research characterized by fundamental changes in both the available sources of data and in theoretical framework used to interpret them. The optically-stimulated luminescence dating of the Sennaya-1 site within the range of 230 – 140 ka sets a new agenda for Paleolithic archaeology on Sakhalin, and in Northeast Asia in general. This new period has only just begun and needs further consideration. It is mentioned here only to make the historiography of these investigations more complete

The present paper summarizes the results of the first period of the research on the Paleolithic of Sakhalin Island. It introduces the most recent data, primarily from the Ogonki-5 site, and supplements and amplifies the conclusions drawn by earlier researchers. Additionally, the interpretation of some sites, especially Ado-Tymovo, needs reevaluation, which will be presented below.

Paleogeography, topography, and stratigraphy of Upper Paleolithic sites on Sakhalin

Paleolithic sites presently known from Sakhalin are situated on the southern part of the island, in adjacent valleys of the Susunai, Lyutoga, and Naiba rivers. Today, the Lyutoga and Naiba are secondary valleys with regard to the broader Susunai valley. However, paleogeographic reconstruction suggests a quite different picture. During the Würm glacial maximum, sea levels were lower than at present and, according to various estimates, were from 100 to 140 m below present levels (Geologicheskoe razvitie..., 1968; Gorbatenko, Southon, 2000; Hosino, 1986; Korotky et al., 1997; Mechetin, 1988; Ota, Machida, 1987). Correspondingly, the paleo-Lyutoga was 60 – 70 km longer than at present. Together with the Tym and Poronai paleo-rivers, it was one of the main fluvial arteries of the island The Susuya and other rivers of the Susunai valley, as well as all their streams flowing across the present coast of Aniva Bay, were its tributaries. The estuaries of these rivers were located along the ancient seacoast, which during the last glacial maximum was at the present depths of 100 – 140 m.

Models of ancient coastal areas of the Sakhalin–Hokkaido Peninsula are represented in a most spectacular way on hypsometric maps published in an atlas of geological development of the Japanese Islands, as well as in the works of Y Ono and Y. Igarashi (Geologicheskoe razvitie ..., 1968; Minato (ed.), 1977; Ono, 1999, Ono, Igarashi, 1991). During the Sartan period, the present Aniva Bay was a vast swampy plain, and the paleo-Lyutoga was the major fluvial feature dissecting it (Fig. 1). The Lyutoga and

Table 1. Topographic location of Upper Paleolithic sites (20 – 12 ka BP) on Sakhalin

Site	Height (meters) above		Distance (meters) to.	
	river level	sea level	ravine	bluff
Ogonki-5, locality 1	43	62	40	60
Ogonki-5, locality 2	42	61	60	30
Ogonki-5, locality 3	44	63	30	100
Ogonki-5, locality 4	43	62	20	80
Urozhainoe-1	60	75	50	30
Urozhainoe-3	65	75	50	20
Starorusskoe-1	45	75	Over 100	Over 100
Starorusskoe-3 (Chitinka)	35 – 40	60 – 65	–	–
Olimpiya-1 and 2	30 – 50	100 – 120	20 – 30	Over 100
Sokol	35 – 40	65 – 70	-	50 – 100
Ruchii-1	45 – 50	55 – 60	30 – 50	30 – 50
Sennaya-1 and 2	50	60	–	–

Yubetsu (Hokkaido) estuaries were located at a distance of only 130 – 150 km from each other, not 300 – 350 km as they are now. Both rivers dissected the ancient seacoast, now submerged. According to our model, both Paleolithic regions are regarded as two adjacent aspects of one Upper Pleistocene geographical province. The latter was connected with a paleo-gulf into which the paleo-rivers of Poronai, Naiba, Lyutoga, Yubetsu, and Tokoro and their tributaries flowed. The northern extremity of this area is Cape Terpeniya, while the southern extremity is Cape Lovtsova on Kunashir Island (Ono, 1999: fig. 2.3, 2.4) (see Fig. 1).

Arguing in favor of the existence of an isthmus between Sakhalin and Hokkaido during the Sartan period, Y. Ono compares the La Pérouse Strait bathymetric data with information on the extent of marine regressions, and also on the migration of members of the so-called "mammoth fauna" including mammoth (*Mammuthus primigenius*), elk (*Alces alces*), giant deer (*Megaloceros yabei*), and bison (*Bison* sp) to Hokkaido through Sakhalin (Minato (ed.), 1977; Ono, 1999).

The Susunai Valley formed a "corridor" between the northern and southern parts of this gulf during the glacial epoch. The intermontane depression located at the present La Pérouse Strait connected this province with the northern Sea of Japan, where another deep-water half-closed gulf existed. One of its coasts was at northern Primorye, another at the western coast of Sakhalin. Both gulfs, eastern and western, formed adjacent coastal provinces of the Sakhalin–Hokkaido landmass They were characterized by a combination of various landscapes, including sea coasts, highlands with glaciers on mountain summits, swampy lowlands, tundra, forest-tundra, and, in the southernmost region, taiga. Deposits of obsidian in the southern portion of this area form another important characteristic feature (Kuzmin, Popov (eds.), 2000). Ice sheets did not reach this zone even during the Würm glacial maximum and were restricted to Sakhalin mountain ranges (Alexandrova, 1982). Hokkaido was a peculiar oasis, a refuge for thermophilic organisms that inhabited the Sakhalin–Hokkaido landmass. Thus, the latter was a peninsula situated at the contact zone of cold periglacial North Asia and the warm forested zone of East Asia (Ono, 1999: 34 – 36, fig. 2.5, 2.6).

Upper Paleolithic sites on Sakhalin are located on the third and fourth fluvial terraces that are from 30 to 65 m above present river levels (Table 1). As a rule, they are at considerable distances from the steep riverbanks. The characteristic feature of these sites is their proximity to multiple, branching, steep-sided ravines. The sites usually occupy gently sloping dry ground near fresh-water springs and streams. This last circumstance is significant, since the consumption of river water during seasonal salmon runs can be dangerous for it may be poisoned by decomposing fish.

The coastal regions of Sakhalin are characterized by the persistent location of contemporaneous sites at corresponding levels, which is conditioned by the equally persistent correspondence of landscape forms to historical changes of the level of the global oceans (Fig. 2). The Upper Paleolithic sites investigated on Sakhalin are embedded in enclosing deposits, hard light-brown mustard color and whitish loams at depths from 20 to 80 cm. The stratigraphy of the Ogonki-5 (Fig. 3) and Sokol sites is typical and demonstrative in this regard.

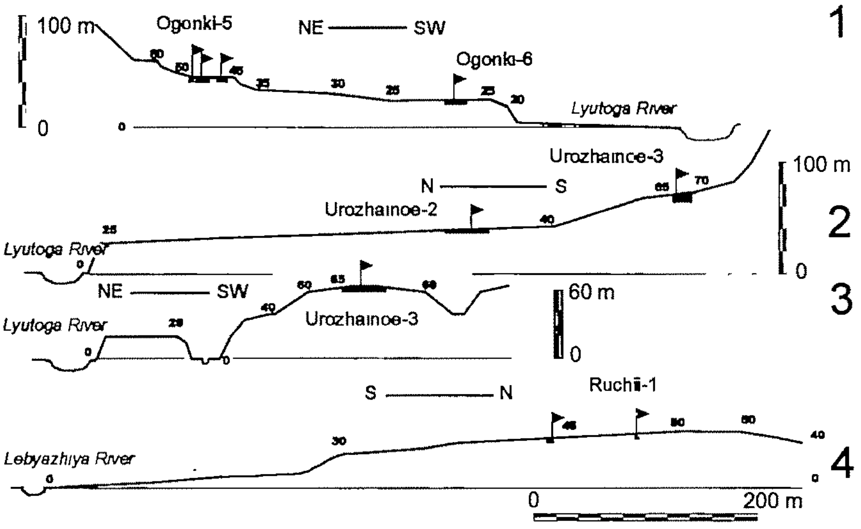

Fig 2. Locations of Upper Paleolithic and Initial Neolithic sites in the river valleys of southern Sakhalin.

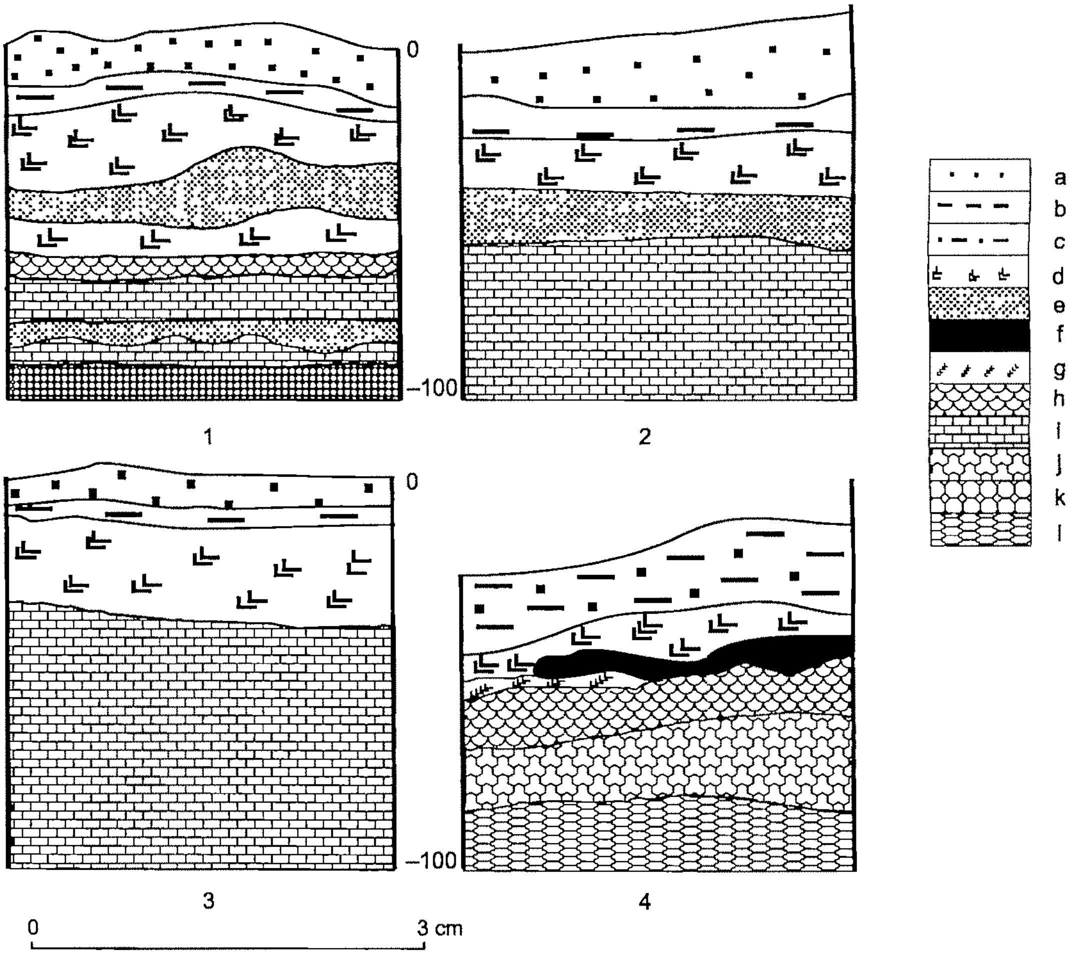

Fig 3 Selected sections of stratigraphic profiles typical of the Upper Paleolithic – Initial Neolithic of southern Sakhalin.
1 – Ogonki-6, *2* – Urozhainoe-3, *3* – Starorusskoe-4, *4* – Ogonki-5, *a* – turf and humus, *b* – sandy loam, *c* – plow zone, *d* – mustard-colored loam, *e* – sand, *f* – black loam with charcoal, *g* – light brown clay, *h* – yellow clay, *i* – white clay, *j* – brown clay, *k* – detritus, *l* – dark flecked clay with detritus.

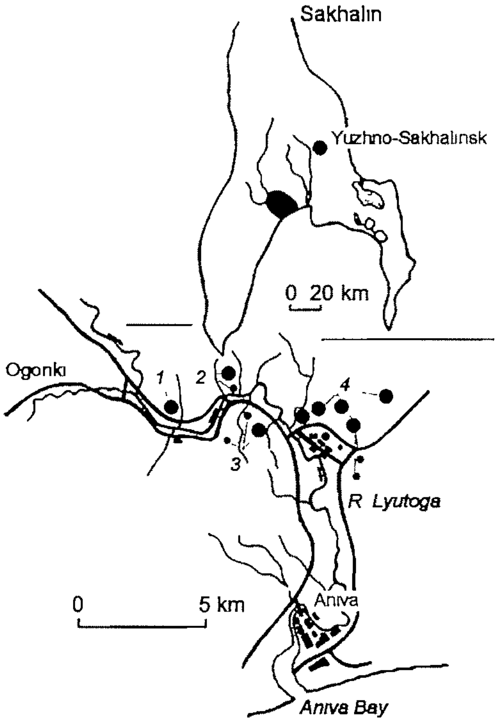

Fig 4 Upper Paleolithic and Initial Neolithic sites on the lower Lyutoga River
1 – Ogonki-7 ("Mandarinka"), *2* – Ogonki-5 and 6; *3* – Ogonki-8 ("Urozhainoe, loci 1 – 3"), *4* – Petropavlovskoe-1 – 7

Ogonki-5

The Ogonki-5 site (46° 46' 53.2" N, 142° 28' 52.9" E; see Fig. 1, *1*) was discovered in 1993 (Vasilevski, 1996, 1997). It is located in the Aniva District, six kilometers northeast from the village of Ogonki, on the third terrace of the left bank of the Lyutoga River (Fig. 4, *2*; 5). The site consists of five separate artifact occurrences found in recently plowed formerly virgin land that lies between two streams on the piedmont of the Kamyshovy mountain range (Fig. 6). As identified by Kuzmin, in the eastern part of this area, the edge of a Middle Pleistocene alluvial terrace has been preserved. The surface layers have been destroyed by agricultural plowing but the cultural layer which is at greater depths has been well preserved *. In 1994 – 1996, the Lyutoga Paleolithic Expedition conducted investigations at Locus 1 where an area of 170 sq. m was completely excavated and three stratigraphic horizons were distinguished (see Fig. 3, *4*).

The stratigraphic sequence revealed at the site is as follows:

stratum 1 – plow zone and undisturbed dark-brown loam,

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* Fortunately, the site was discovered when tillage had just begun and only the uppermost layer had been turned over with a light plow.

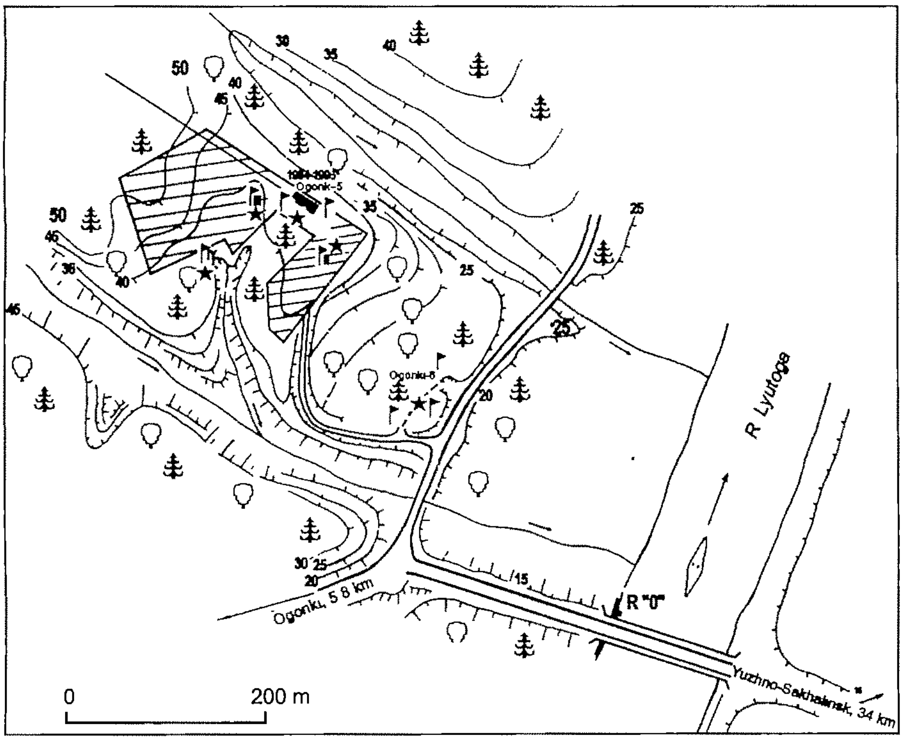

Fig 5 Plan of the Ogonki-5 and 6 Paleolithic sites .

Table 2 Chronometric dates for Ogonki-5

Sample origin	Collector and analyst of the sample	Laboratory number	Radiocarbon date, BP (as from AD 1950)
Square G-21, stratum 3	YV Kuzmin and A T Jull	AA-23137	17,860 ± 120
Square C-22, substratum 2B, pit 1	YV Kuzmin and A T Jull	AA-25434	18,920 ± 150
Square B-21, substratum 2B, pit 1	YV Kuzmin and A T Jull	AA-20864	19,320 ± 145
Square C-30, hearth 1	S Tsuji and Beta Analytic Co	RH-114 Beta-115986	19 380 ± 190
Square B-C-31, hearth 2	S Tsuji and Beta Analytic Co	RH-115 Beta-115987	19,440 ± 140
Square G-21, stratum 3	YV Kuzmin and A T Jull	AA-23138	31,130 ± 440

stratum 2 – heavy mustard-colored loam;

substratum 2B – black loamy carbonaceous soil;

substratum 2C – clay with structure similar to the mustard-colored loam, but differing in its greater density and light-brown tints (total thickness in the dwellings, up to 30 cm);

stratum 3 – compacted yellow clay with light-mottled tones;

stratum 4 – viscous clay of chocolate color;

stratum 5 – a compacted, dark, brick-colored, flecked clay with detritus, forming bedrock at a depth of 75 – 80 cm.

Below this level down to a depth of 1.5 m from the present surface, clays of dark-mottled hues of brown, orange, white and light-blue colors occurred. In the lower part of the profile, they are permeated with detritus. Below the clay cover the bedrock terrace was revealed. The bulk of the artifacts were found within strata 1, 2, 2B, and 2C at depths down to 45 – 50 cm, while isolated artifacts were encountered deeper, down to stratum 3.

Absolute dates were generated on samples from strata 2B and 3 by the University of Arizona and the Beta Analytic Corporation (Miami) (Table 2)*. The dates obtained for the mustard colored loam and yellow clay fall within the range of 30 – 18 ka and correspond well with the Ogonki-5 stratigraphy, described above. It finds analogies with the Paleolithic site of Kashiwadai-1 (Hokkaido), which resembles the site under consideration in a complex of traits.

Horizon 1. Artifacts (Fig. 7) were recovered from the plow zone. During forest clearance, and plowing, humic, podzolic soil (0 – 0.15 – 0.2 m) was overturned, and occasionally dark-brown loam and upper part of the mustard-colored loam beneath it were also contacted. The basic layer with cultural remains corresponds to the brown loam. Within this horizon 1,335 artifacts were found, including typical and needle-shaped microblades and microspalls (59 specimens); small, medium, and long blades; and tools on blades (120 specimens total), in particular pieces with edges bifacially worked with pressure retouch. We define "typical microblades" as those which are 2 to 5 cm long and 0.5 to 1 cm wide. The term "needle-shaped microblade" is introduced here for the first time. This is a miniature needle-like blade, usually removed from the frontal side of a boat-shaped microcore less than 2 cm in length and less than 2 mm wide. These needle-like microblades were probably a by-product of the utilization of boat-shaped cores Under the microscope, it can be seen that their morphology precisely repeats the morphology of standard microblades. Among tools fashioned on blades. there are lateral, dihedral, and transverse stemmed burins (25 specimens) (Fig. 7, *5, 7*), end-scrapers (7 specimens) (Fig. 7, *3*), knife-shaped artifacts (64 specimens), bifaces (2 specimens) (Fig. 7, *4*), and wedge-shaped microcores (16 specimens) (Fig. 7, *7*), including those made from blades. One prismatic core for the detachment of blades and core-like lithic chips were also identified. In addition, wedge-shaped points made from blades (10 specimens), retouched artifacts interpreted as saws due to the presence of slanting grooves along their edges (4 specimens), and one miniature polished chisel were found. In addition to those made on blades, artifacts made on flakes (28 specimens) were also noted. They are represented by stemmed (probably dart) points (3 specimens; Fig. 7, *1*, 8) and by points of an indeterminate type (3 specimens), burins and gravers (9 specimens), knives and unifaces (6 specimens), end-scrapers (4 specimens), also a solitary discoidal scraper and side-scraper. The débitage is represented by 1,074 flakes and chips, including burin microspalls. Special attention should be paid to stemmed points and burins, the discoid obsidian scraper, polished chisel, and gravers. Objects such as these as well as the occurrence of the flake technique are typical of the Initial Neolithic of this region. Mention should also be made of the recovery of a burin made on a flake in the form of a salmon fish with clearly represented characteristic dorsal hump (Fig. 7, *2*).

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* We take this opportunity to express our sincere thanks to Y.V. Kuzmin, A T. Jull, and S Tsuji for their help in dating samples recovered during the excavation of the Ogonki-5 site

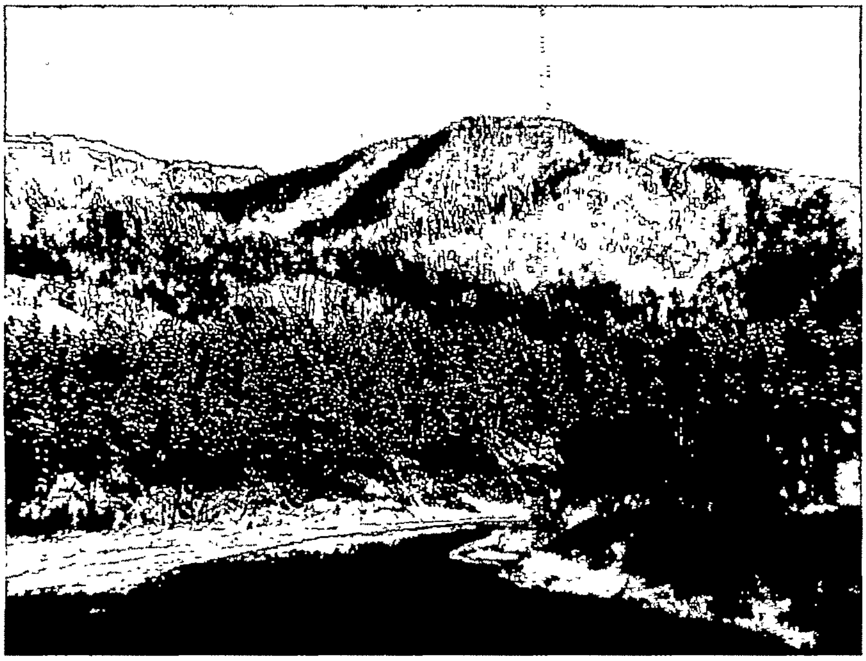

Fig 6. Ogonki-5 site view.

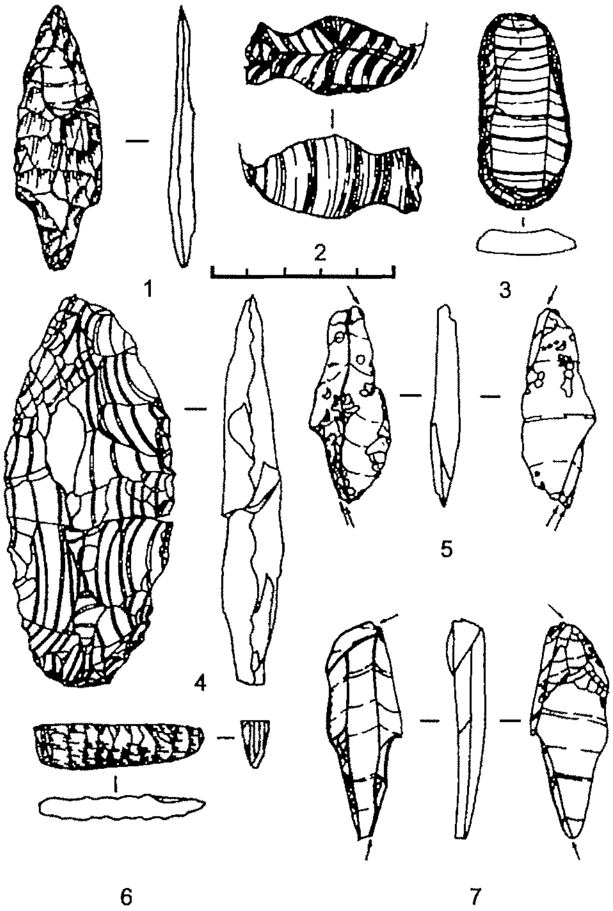

Fig 7 Lithic artifacts from horizon 1, Ogonki-5.

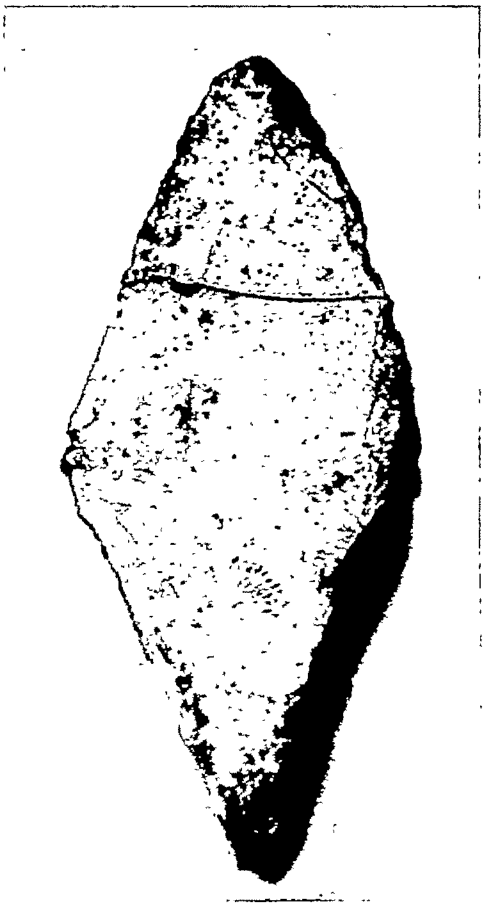

Fig. 8 Stemmed point made by the Ogonki technique, stratum 1, Ogonki-5

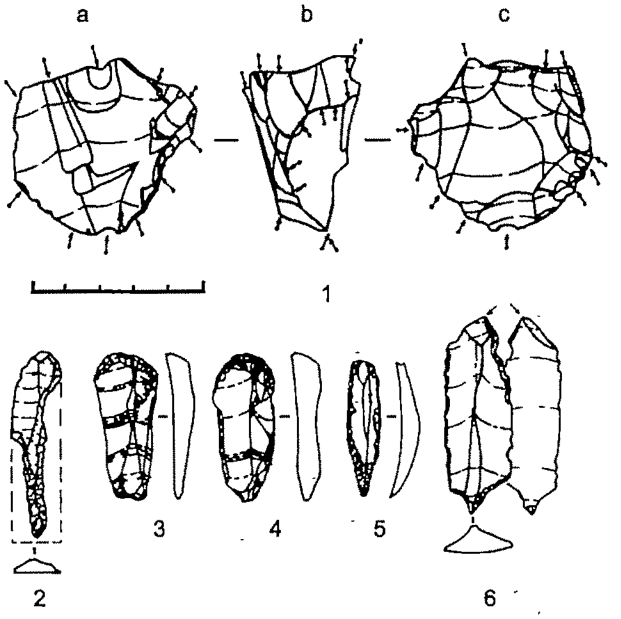

Fig. 9 Lithic artifacts from horizon 2, Ogonki-5.

Typologically, it is a side burin, and the burin spall indicates a later technology in comparison with the burins from layer 2. Amber pebbles were also found, which do not come from this mountain region, and are quite interesting. They point directly to a connection between the site and the ancient seacoast, which was not 15 km from the site at that time, but rather 90 to 100 km distant. A biface and two refittable chips (see Fig. 7, *4*) are noteworthy, as is an elongated, oval, bifacially worked retouched knife of the Mikoshiba type.

The materials recovered from horizon 1 exhibit parallels with collections from such sites as Takoe-2, Odoptu, and Imchin-1 (Sakhalin), Gorbatka-3 and Ustinovka-3 (Primorye), and Tatikawa-2 and 3, Tatikaru-shunai, and Mikoshiwa (Hokkaido). The collective information permits assignment of the site to the transitional final Upper Paleolithic to initial Early Neolithic. The chronological boundaries of this group of sites coincides with dates for the "stemmed point tradition" of northern Japan some 13 – 8 ka. We note that in the last decade the dates for stemmed points in central Japan have been pushed back to 15 ka BP, and on Hokkaido to 13 ka BP. However, we should accept such dates with caution because in some publications both calibrated and uncalibrated dates are cited indiscriminately. According to their chronological position, archaeological complexes of the Takoe-2 and Ogonki-5 (horizon 1) type clearly correspond with the layer of brown loam described above and which lies under the layers of sandy loam and podzolic soils on terraces from 8 – 10 to 15 – 20 m above the present river level. This also allows us to ascribe them to the end of the Pleistocene or beginning of the Holocene within the same chronological framework as the dates suggested above (13 – 8 ka BP).

Horizon 2. Finds are associated with a layer of mustard-colored loam (0.2 – 0.45 m). Horizon 2 was distinguished as a level with artifacts rather than as a true cultural layer. A total of 2,523 lithic objects were found here, including 19 boat-shaped microcores, and one prismatic and one discoid core (both of chert) (Fig. 9, *1*). Among the other objects recovered, there are standard and needle-shaped microblades (109 specimens), medium and long knife-like blades (45 specimens), end-scrapers on blades (23 specimens) (Fig. 9, *3 – 5*) and on flakes (7 specimens), transverse burins (18 specimens) and points (Fig. 9, *6*), knives and unifaces, burins and gravers on flakes, etc. Débitage is represented by amorphous cores (2 specimens), as well as by flakes, chips, and burin microspalls (2,204 specimens). Bifaces, other bifacially worked tools, round scrapers, and projectile points are absent, making this assemblage distinct from the materials recovered in horizons 1 and 3. Artifacts from horizon 2 can be classified into two groups according to their relative degree of patina – less or more patinated. An interesting feature of the less-patinated artifacts (all of them made on black basalt) is a specific technique of fashioning the stem by pressure flaking of microblades and microflakes from the ventral surface of a blank. The stem is formed at the distal margin of the blade (see Fig. 9, *2, 5*). The ventral part plays the role of pressure platform. A stemmed point, probably a projectile armature, found in layer 1 was manufactured using the same technique. Typologically, however, it is more similar to artifacts from layer 2 (see Fig. 8). The peculiar technique described above, the so-called "Ogonki technique," was also used for production of boat-shaped microcores made from macroblades. Most successfully, however, it was used for making tool hafts, e.g., of a burin and a scraper (see Fig. 9, *2, 5*). They resemble microcore types A2.1, A2.3, and A2.5 in the classification system proposed by Derevianko et al. (1998). The only significant difference is that unlike the variants described by these authors, the Ogonki microcores were made not only on flakes but also on macroblades. Evidence of the use of this technique is provided by four tools with hafts and by a series of boat-shaped microcores with curved profiles, corresponding to the profile of the original blade. In addition, bulbs of percussion are preserved on such boat-shaped microcores. This argues in favor of their having been made on blades produced by the Ogonki technique. Some microcores of this type are 10 cm long; i.e., they are made on medium size blades. It is likely that in cases of the urgent need for

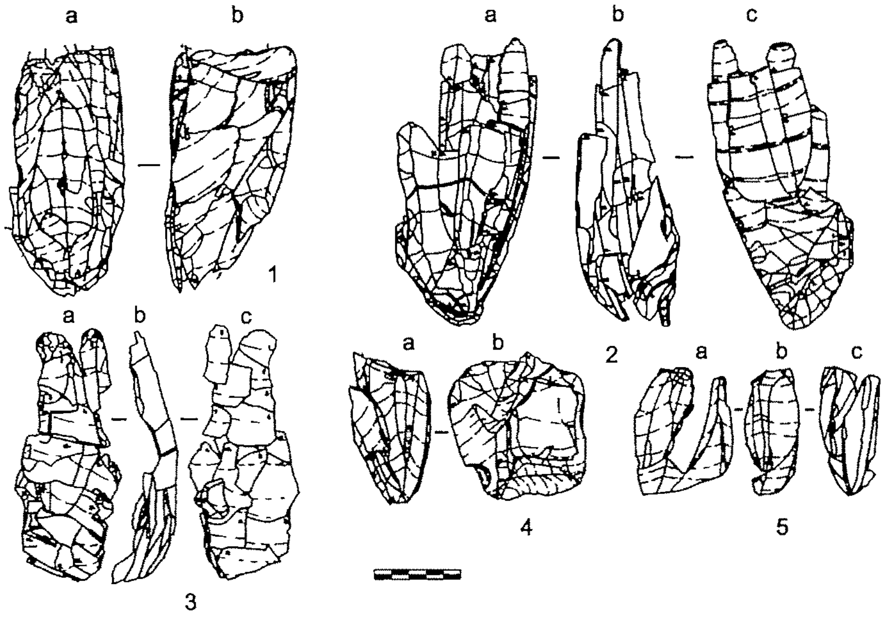

Fig 10. Lithic artifacts from dwellings I and II, horizon 3, Ogonki-5

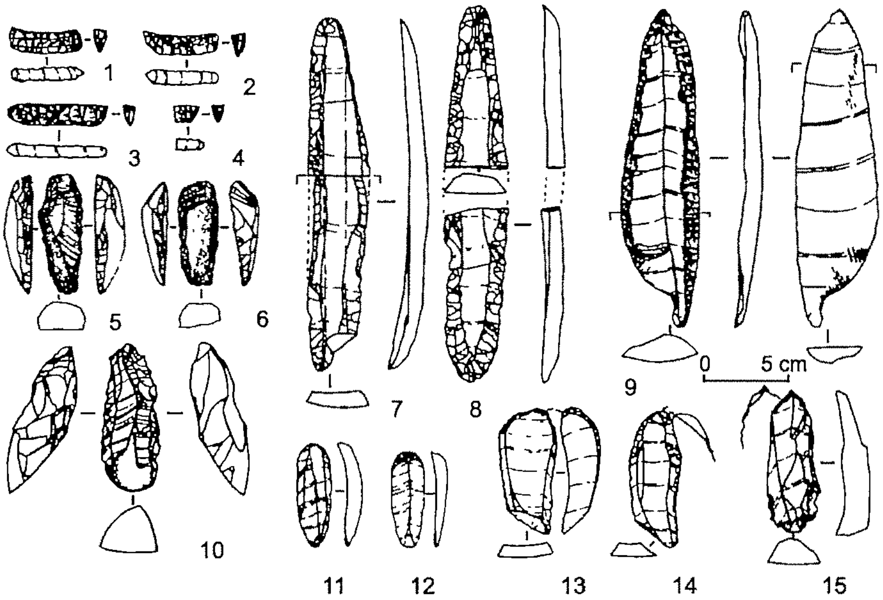

Fig. 11. Lithic artifacts from dwellings I and II, horizon 3, Ogonki-5.

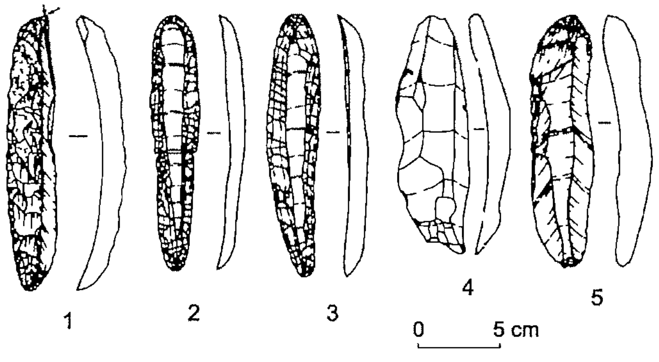

Fig. 12 Macroblades from dwellings I and II, Ogonki-5

microblades or in circumstances in which tools made from macroblades were broken, the corresponding technique for manufacturing cores was applied to medium blades.

One concentration of artifacts with characteristic features of the Ogonki technique was found in the eastern part of the excavation area near the accumulation of finds in sq. B – C-29-30. Others were recovered from different parts of the excavation area. A slight patina on corresponding objects as well as the absence of distinct concentrations of this particular material are sufficient reason for regarding horizon 2 to be a separate part of the site. According to its stratigraphic position, this unit must be dated to the interval between the formation of horizons 1 and 3, i.e., a possible age of 18 to 13 – 11 ka BP. A radiocarbon date of 17,860 ± 120 BP (AA-23137) corresponds with the lower chronological limit of horizon 2. This assemblage consists of three groups of artifacts which are typologically different, though found in the same stratum: (1) artifacts corresponding to the assemblage from horizon 1; (2) artifacts characterized by the specific Ogonki technique, i.e., the use of blades for the production of cores; and (3) artifacts from the underlying layer or pieces typologically identical to them, but having a somewhat later origin.

Horizon 3. Finds from strata 2B and 3 (0.4 – 0.7 m) are combined into one lower assemblage. In addition, a series of artifacts obtained from stratum 4 were included in the collection from this horizon. Most of the artifacts were discovered in thin black lenses embedded in the main layer and in a very compacted light colored flecked clay (remains of the floors and fill of pits saturated with charcoal). These black layers are literally "stuffed" with microscopic particles of hematite (a mineral pigment), and chips of flint and obsidian. As was mentioned above, this horizon was dated within a range of 30 – 18 ka BP. In total, 11,450 artifacts were found here, particularly wedge-shaped microcores (66 specimens), all narrow-face flake macrocores (10 specimens), amorphous nuclei, core-like shatters, and cores reconstructed by method of refitting (11 specimens), flakes, spalls, chips, burin microspalls (8,390 specimens), standard microblades, microchips and needle-like microblades (339 specimens), medium-sized blades and macroblades, as well as tools manufactured on them (305 specimens) (Fig. 10 – 12). Retouched tools on flakes and spalls are rare (21 specimens) and are mostly represented by burins, end-scrapers, and points.

Tools for wood processing were found in the lower part of stratum 2, near its border with the underlying stratum 3 and in stratum 3 itself. They include a partly polished adze of basalt and adze-and-scraper-like tools made of chert (Fig. 11, *5, 6, 10*). A striking peculiarity of these tools is that they were made using the same technique as the wedge-shaped Horoka cores. The following stages of their production are clearly recorded: (1) removal of a massive unifacial-convex blade from a core, (2) detachment of pebble cortex from dorsal face, and (3) polishing of the working edge. On the dorsal surface of two adze-and-scraper-like tools of green chert, cortex has been preserved, though polishing is absent (see Fig. 11, *5, 6*). On the contrary, the adze made from a basalt pebble displays a thoroughly polished edge and was not used as a side-scraper (see Fig. 11, *10*). The assemblage from horizon 3 demonstrates a series of important characteristics:

(1) artifacts are concentrated and refittable;

(2) patinated artifacts of basalt, green slate, alevrolite, tuff, chert, etc. are dominant;

(3) although some variation in the manufacture of microcores exists, all fit the Horoka technological scheme; differences between separate nuclei are due to peculiarities of blanks and of raw material,

(4) most of the macroblades were discovered in the lower strata; blades with triangular and, more rarely, trapezoid cross-sections, including pieces with parallel sides and amorphous outlines, are present; usually these are multi-function tools such as knives, scrapers, burins, points, etc.;

(5) many blades were intentionally broken, and fragments used as tools. This is confirmed by the fact that different parts of single blades with working edges worn to different degrees have been discovered in various assemblages and inside different dwellings.

Lithic artifacts from horizon 3 demonstrate direct parallels with sites such as Urozhainoe-3 on Sakhalin; Ustinovka-1 and Suvorovo-3 in Primorye; Tarukishi, Kashiwadai-1, Shirataki-1 and 32, and Tatukarushunai "C" in Japan; Suyanggae in Korea; and Hutouliang in China.

A graphic model of the site. Dwellings, hearths, and working areas

Artifacts from horizon 3 formed two extensive concentrations which were at a distance of 5 m from each other (Fig. 13). These assemblages were found in well-preserved pit hearths from 7.5 to 8.5 m in diameter. They are the traces of surface dwellings. The stained black paleosol, saturated with charcoal, flakes, chips, and the like (substratum 2B), is the true cultural layer, in this case the remains of the dwelling's original floor. Pits filled with soil and charcoal flecks are hearths. To increase information and the interpretive potential of the data recovered, graphic models for each layer of the excavated portion of the Ogonki-5 settlement have been created (Fig. 13). Every layer of excavation is represented separately. The graphic modeling of this settlement during investigation permitted separation by provenience of artifacts in different layers, which helped to make the boundaries of areal assemblages more accurate. To accomplish this, we merged the perceived links between objects and refittable parts of artifacts and projected them onto one, two, and three virtual surfaces. If, in the field, a single layer was subdivided into two thinner lenses, the subsequent overlapping of plans provides the opportunity to restore information in the graphic model. On the contrary, assemblages of different ages manifest themselves in the incompatibility of separate objects after their graphic overlapping. The mapping of links in stratum 1 demonstrates that most of the finds from the plow zone are not directly related to the assemblage with points, but came from the site's lower horizons. The mapping of core reduction sequences permitted us to identify working areas where the flaking of each of the nuclei (during the course of a week? a month? a season?) took place. It was determined that the basalt core (see Fig 10, *2*) was knapped inside the confines of dwellings I and II. Inside the same space, the preforms of scrapers, adze-and-scraper-like tools and cores of green chert were locating. This suggests that cores were common property, brought from one dwelling to another. The flaking of blades and semi-fabricated blanks for tool making occurred at several working areas within two concentrations in dwellings I and II (see Fig. 13).

A serious problem with respect to determining the age of the Ogonki-5 settlement is associated with the three adze-and-scraper-like tools described above, two of them of chert (see Fig. 11, *5, 6*) and one of basalt (see Fig. 11, *10*). The polishing evident on one of them seemed initially to argue in favor of their originating in horizon 1, i.e., in the assemblage with points. However, mapping and graphic modeling of spatial distributions of finds of green chert, including the adze-and-scraper-like tools, made it possible to associate them with the lower assemblage, particularly with several dozens of spalls and a core of green chert from the floor of dwellings I and II. Using the same procedure as employed for the cores, links between refitable macroblades and other artifacts were mapped and modeled. Thus, for example, a knife-like basalt blade was subdivided into three segments in prehistory (see Fig. 11, *7*). The proximal and distal parts that do not match each other were found in dwelling I and the medial segment was recovered in dwelling II. Parts of this tool were used separately and to different ends. Varying degrees of use-wear on the working edge of these fragments is evidence in favor of such a hypothesis. In case of the shortage of raw materials (e.g., in winter), a craftsman apparently divided one large blade into segments and used each one separately or gave it to another member of his community who was in need of raw material, for example, perhaps to a person who lived in a neighboring house. These behavioral observations which have been made possible thanks to the modeling of thoroughly documented human activity at Ogonki-5 are related to the study of property relations and patterns of life in preindustrial communities. The coexistence of two dwellings at the early settlement is proven by the model and by four AMS dates that fit an interval of 20 – 18 ka BP. The modeling of the excavated portion of Ogonki-5 made it possible to reveal one more dwelling (III) which has no immediately apparent relation to the other two (see Fig. 13, III). This conclusion is suggested by concentrations of material to the northwest of dwelling I as well as by the spatial distribution of refittable artifacts. Corresponding links between dwellings I and II do not extend to the area of the third dwelling despite the fact that the outlines of dwellings I and III overlap. The existence of small hearths around the center of the concentrated finds in assemblage III also argues in favor of the existence of one more dwellings at this place.

A thorough analysis of the plan, taking into consideration all information obtained in the field, leads us to conclude that all the three concentrations of lithic material have several features in common:

(1) artifacts were concentrated around a central area;

(2) the solidity of clay floors inside the dwellings is, as might be expected, much greater than that of areas between dwellings; the floors were stamped down to a nearly pavement-like state;

(3) concentrations of artifacts were found in association with hearths (there are two fire pits in dwellings I and II and three charred spots in dwelling III);

(4) the hearths are located near the center of the dwellings from the eastern and the northern sides, suggesting that the entry/exit from the houses was to the south or southwest, i.e, facing the river;

(5) the upper level of the ash layer of the hearths in dwellings I and II has been already exposed at the middle level of stratum 2, the mustard-colored loam. This may be explained by the fact that the upper defining elements of large hearths protruded above the floor level. The bottom of the fire pit extends down into the dark mottled clay. The concurrence of dates from these hearths is also supported by their similar stratigraphic position;

(6) neither networks of postholes nor stones which would lock poles in place have been found. Isolated pits are found inside the dwelling space, adjacent to hearths. Dwellings were probably not excavated deep into the ground. They must have been frame constructions with round plan forms with frame poles bent towards the inside and probably leaning against the ground.

Attention should be drawn to the existence of two distinct floors in dwelling II. In correspondence with the natural slope of the ground, the eastern occupation surface that is near the hearth is 5 – 8 cm higher than the western one. One gets the impression that both occupation surfaces were intentionally leveled in

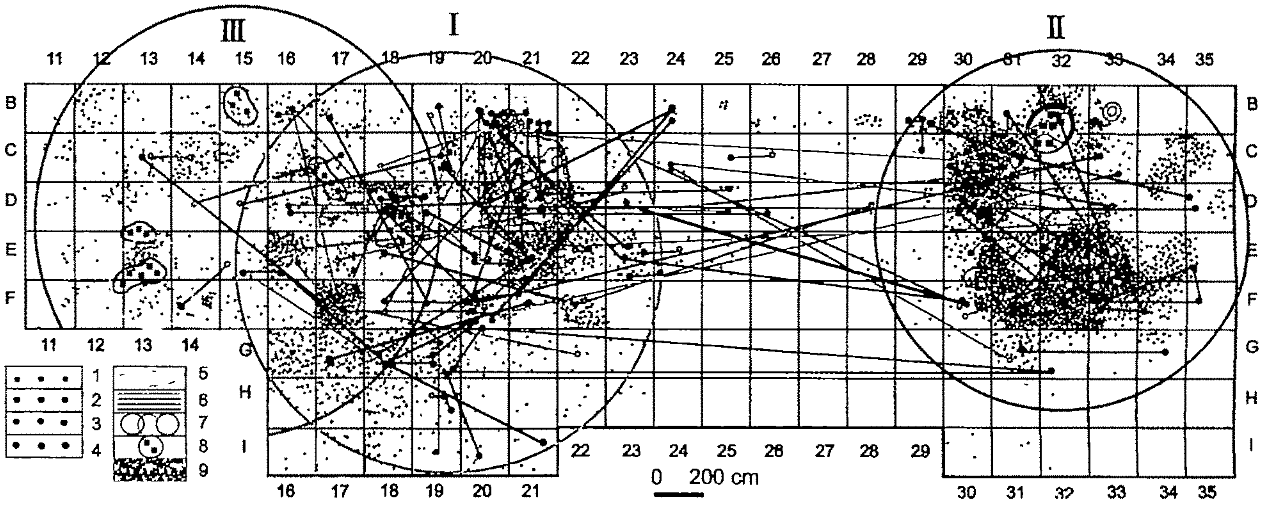

Fig. 13 Plan of excavation area (1994 – 1996) at Ogonki-5
1 – finds from stratum 1, *2* – finds from uppermost stratum 2, *3* – finds from the lower unit of stratum 2 and from substratum 2B, *4* – finds from strata 3 and 4; *5* – hypothesized outlines of dwellings, *6* – links between refittable artifacts, *7* – stone knapping area, *8* – charcoal; *9* – miscellaneous finds

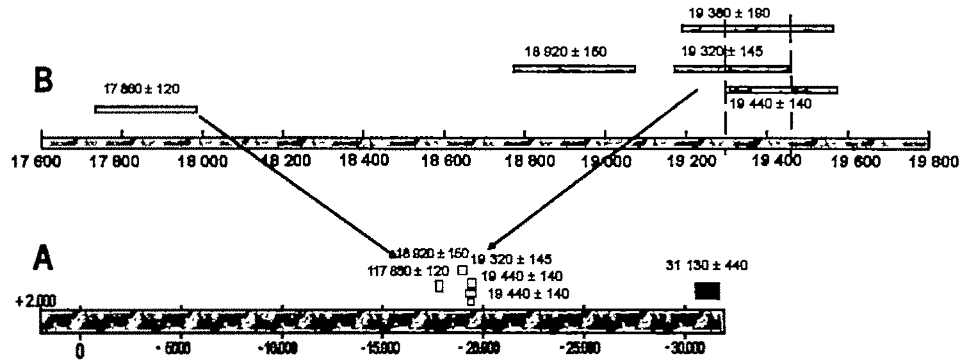

Fig 14 Radiocarbon dates from the Upper Paleolithic site of Ogonki-5.

prehistory and the horizontal positioning of artifacts on the floor in strata 2B, 2C and 3 argues in favor of such a conclusion. In addition, three low mounds of clay and concentrations of charcoal between them are recorded on the floor in the western part of the dwelling. These features are interpreted as elements of a working area where the processing of stone was undertaken and probably, from time to time, a fire was made.

Comparing our data with the classical reconstruction of Kostienki dwellings by Yefimenko (see (Beliaeva, 1998)), we can see that the Ogonki houses occupy significantly smaller areas and have round plans rather than elongated ovals and are therefore more similar to Paleolithic dwellings in Siberia. The reconstructed area of these houses ranges from 50 sq. m (dwelling II) to 60 – 63 sq. m (dwellings I and III). Dwellings I and II functioned simultaneously throughout the autumn and winter seasons, i.e., during at least half the year. The lack of any hearths and working areas connected with them in the area between houses argues in favor of their contemporaneity. This suggests that most activity directed toward the manufacture of tools and the preparation of food took place indoors, as might be natural only during the cold seasons.

Dating of the site

The excavated portion of the Ogonki-5 site consists of three more or less complete assemblages:

(1) a horizon with stemmed points;

(2) a horizon with microcores made on blades;

(3) a horizon with hearths, dwellings, and macroblades.

In addition, isolated finds which, according to their appearance, would be attributed to earlier periods than the finds described above also exist. A frontal spall of basalt eroded by soil acids and two large, flattened flakes with negatives scars of triangular spalls are among them. These three pieces share nothing in common with the blade assemblages discovered in the excavation area. An AMS date of 31,130 ± 440 (AA-23138) on a sample recovered from the southeastern part of the excavation area is the earliest such date for the Upper Paleolithic of Sakhalin (see Table 2, Fig. 14), and stands apart from the rest of the available dates. According to the radiocarbon determinations, the age of dwellings I and II, and consequently of the site itself as is reconstructed for horizon 3, falls within the range of 20 – 18 ka BP (Kuzmin et al., 1998). The correlation of dates within the framework of the graphic model (see Fig. 14) demonstrates that two of them, 17,860 ± 120 and 31,130 ± 440, fall away from the main group dates which, in case of mutually overlapping sections, distinctly provides a range of 19,300 – 19,450; i.e., an average of 19,375 ± 75 BP.

Thus, the well-stratified and thoroughly documented site of Ogonki-5 is the most important source of data for the study of the Upper Paleolithic of insular Northeast Asia and should be regarded a strong basis for further research in the region.

Problems of periodization of the Upper Paleolithic on Sakhalin

The first periodization scheme for Upper Paleolithic sites on Sakhalin was published by Vasilievskiy and Golubev (1976). Later, Golubev and Lavrov (1988) suggested a broader scheme for the evolution of Paleolithic industries and singled out several Upper Paleolithic cultures. In this scenario, the "Ado-Tymovo model culture," based on the Levallois tradition of stone knapping, was selected to represent the earliest stage (30 – 20 BP) of the Sakhalin Upper Paleolithic. The second stage (Sokol 1 and Takoe A) has been traditionally correlated with the "late or possibly even early Shirataki Culture," and the Early South Sakhalin Culture dated to 16 – 12.5 ka BP was further distinguished within it. The third stage (Sokol-2*, Takoe B, and Imchin-1), including the Middle South Sakhalin and Imchin Cultures, was referred to 12 – 10 ka BP. The fourth stage represented by the Late South Sakhalin Culture (Takoe C, Odopty, and Kadylania) corresponds to the interval from 9,000 BP "to the appearance of ceramics" (Ibid.: 212 – 214). Pebble tools picked up at the quarry at Imchin-2 and at the plowed field near Ado-Tymovo village were attributed to the Ado-Tymovo Culture*. The identification of this culture was based, on the one hand, on the presumption of the co-existence of pebble and blade technologies in the Upper Paleolithic, and on the other hand, on the "typological distinctiveness" of the pebble tools found at the Ado-Tymovo site. The vague nature of the geological situation at the site and the controversial dating of these artifacts has been recognized by many researchers (Ibid.: 212, Gorbunov, 1990; Gorbunov, Prokofiev, 1990; Vasilevski, 1996). However, at that time no reliable stratified sites earlier than 12,000 BP were known on Sakhalin, and this precluded the substantiation of the sources of data. At present, more data have been accumulated against the inclusion of Ado-Tymovo and Imchin on the list of Sakhalin Upper Paleolithic sites. Here are our arguments. First, unlike Ado-Tymovo, which is situated on a floodplain, all Paleolithic sites are on terrace surfaces, which are 40 m above river level (see Fig. 2). In addition, all known Upper Paleolithic assemblages are associated with heavy loams (see Fig. 3). A startigraphic witness profile of the site, made by the author and Golubev in 1989, exposed fluvial sediments typical of a high flood plain formed in the Late Holocene. Second, ceramics and artifacts of rather late appearance were found *in situ* in the very bottom of the profile, below the so-called "epi-Levallois" pebble tools. Third, our understanding of the nature of Early Upper Paleolithic sites in East Asia underwent significant change. In the 1980s – 1990s, sites bearing a developed blade technique having an age of about 20 ka BP and older were discovered and investigated in the region under consideration. Fourth, no evidence of epi-Levallois and Levallois flaking techniques has been discovered in the Ado-Tymovo and Imchin-2 assemblages. Stone was intentionally knapped there to produce common flakes typical of the Neolithic and the Early Iron Age. The surface of such artifacts also preserves distinct spall removal scars without traces of deflation or erosion characteristic of the earlier sites. All cores from Ado-Tymovo and Imchin-2 exhibit multiple striking platforms, similar to cores made of the same red and cherry colored flint which are found at many Neolithic and Early Iron Age sites. Large accumulations of flint pebbles were recorded on sandbanks near the Ado-Tymovo site. These pebbles were used as raw material, as is suggested by artifacts recovered from plowed fields. Considering the abundance of defective pieces, including flakes, and broken and discarded cobbles, and the small number of complete tools, we regard this locality as a workshop site. This conclusion does not permit the attribution of the Ado-Tymovo site to the Paleolithic period. At the present stage of research on the Sakhalin Paleolithic record, the singling out of the Ado-Tymovo Culture has but historiographic interest.

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* At the Sokol site, locus 1 is thought to represent an early group of artifacts, while locus 2 represents a later assemblage.

* The present author took part in all stages of research at the Ado-Tymovo site and is familiar with the spatial distribution of the lithic artifacts recovered there, the circumstances of their collection, as well as with assemblages deposited at the Archaeological Museum of Sakhalin State University

Correlation and periodization of Upper Paleolithic sites on the Sakhalin–Hokkaido Peninsula

As was mentioned above, the problem of correlation and synchronization of Stone Age sites in these insular territories was raised in scientific literature during the last quarter of the 20th century. At the present stage of research, we reject the use of the "archaeological culture" concept for the Upper Paleolithic of this region and prefer, instead, to consider sites as subsystems of a single territorial, technological and, occasionally, cultural entity. It is more appropriate to speak of sites, industries, assemblages, periods, and stages using categories and methodologies of a systemic approach that implies analysis at compatible levels. Hundreds of papers and monographs have been devoted to the Upper Paleolithic of Hokkaido Island. Most are in Japanese and virtually inaccessible to Russian archaeologists. A few papers and two monographs are published in Russian including *The Paleolithic of Japan* (Derevianko, 1984) and *Stone Age Cultures of Northern Japan* (Vasilievskiy, Lavrov, Chan Su Bu, 1982). Much has changed in the archaeology of Hokkaido since the publication of these remarkable books. New sites have been discovered and studied, new dates generated, and new interpretations proposed. Because the purposeful study of the Upper Paleolithic of Hokkaido was not included among our immediate tasks, we direct our attention here only to the most important sites, conclusions, and discussions.

The Shirataki group of sites is a general term used to designate Paleolithic sites located on the northern piedmont of the Akaishi and Taisetsu Mountains in the Yubetsu River basin of eastern Hokkaido, near Shirataki village. The study of these sites began in 1927, when a schoolteacher, Toma Eikiti, first collected some obsidian artifacts there (Kimura (ed.), 1992: 11 – 12) Since then, several dozens of Paleolithic sites have been excavated in the area. The best known sites include Shirataki-1 (Horokazawa), Shirataki-13, 30, 32, and Tatikaru-shunai (Befu, Chard, 1960; Ikawa-Smith, 1976; Morlan, 1978; Vasilievskiy, 1981; Vasilievskiy, Lavrov, Chan Su Bu, 1982). During 1995 – 1999, extensive investigations were carried out by the Center for the Preservation of Excavated Remains under the direction of Naganuma Takashi. During these investigations nine sites were excavated, in particular Oku Shirataki-1 and 11, Hattoridai-2, Kami Shirataki-2, 5 8, and Kita Shubetsu-4. The excavated area totals 70,000 sq. m and 3.16 million artifacts were recovered. Collections gathered from these sites include only lithics, most of which date to the final stages of the Upper Paleolithic. The majority of artifacts comprise flakes produced during the manufacture of stone tools. The tools total 20,000 or 0.65% of the finds (Naganuma, 1998, 1999; Naganuma et al., 1999).

The excavators have identified concentrations of artifacts, which differ in their horizontal distribution and can thus be regarded as distinct assemblages. They are divided into two chronological groups associated with periods before and after the appearance of microblades. The first group consists of collections from Kami Shirataki-8 and Oku Shirataki-1 containing trapezoidal stone tools (termed "trapezoids," a rather controversial type for us). They belong to the first, earlier period and are characterized by the absence of any blade technique. This chronological group also includes artifact assemblages from Kami Shirataki-7 and 8 characterized by the presence of the Hirosato-type knives and evidence of the blade technique. The second chronological group (with microblades) includes assemblages with microcores of Togeshita (Kami Shirataki-8) and Mommijiyama (Oku Shirataki-1) types, as well as Sakkotsu and Satekiyama cores (Kami Shirataki-2) Complexes with stemmed points contain large numbers of flakes removed in process of core reduction They are accompanied by boat-shaped scrapers, burins, end-scrapers, side-scrapers, and ax-like stone tools. In all of the lithic assemblages described, a relatively large number of refittable artifacts allows enhanced understanding the reduction techniques and production methods employed for each tool type.

The Horokazawa site was discovered in 1954 In honor of its discoverer, Professor Hideaki Kimura gave the name of Toma Eikichi to one of the site's discrete loci. Since 1987, under the supervision of Hideaki Kimura, an area of over 100 sq. m has been excavated. Not only Japanese but also Russian archaeologists have repeatedly taken part in these investigations, among them A.P. Derevianko, R.S. Vasilievskiy, V.I. Molodin, E.L. Lavrov, V.A. Golubev, and many others. The Horokazawa Toma, Togeshita, and Pirika sites are well studied and described in the Japanese literature. They represent different technological complexes which functioned simultaneously on Hokkaido during the period 20,000 – 12,000 BP. Sites of the Shin Chitose group were excavated in the 1990s by the Center for the Preservation of Excavated Remains during the course of expanding the international airport at Sapporo. The earliest of these localities is Kashiwadai-1, an Upper Paleolithic site containing several concentrations of artifacts accompanied by hearths and traces of human activity in distinct working areas. The extraordinary similarity of this site to Ogonki-5 explains its importance for our research.

In traditional Japanese Paleolithic studies, Paleolithic periodization is based on flaking technique, shapes of cores, and specific tool types Additionally, chronostratigraphic criteria are also used, especially the ages of tephra and paleobotanic remains; preference is given to radiometric data, including accelerator mass spectrometry The schemes dominating Japanese Paleolithic studies at the end of the 20th century are well described in the literature (Derevianko, 1984; Vasilievskiy, Lavrov, Chan Su Bu, 1982). Hideaki Kimura distinguished six types of microcores and six corresponding techniques of flaking which were considered to be technical-typological and chronological markers in the Hokkaido Paleolithic, including Horoka, Yubetsu, Pirika, Togeshita, Rankosi, and Oserokko (Kimura (ed.), 1992: 50 – 52). In 1992, he determined two factors that had decisive significance for their differentiation: raw material and regional traditions. He distinguished the Yubetsu-Horoka and Togeshita-Shinmichi techno-complexes. Large blades and thick flakes were used as blanks for microcores. In Yubetsu-Horoka assemblages, bifaces with a natural (Horoka – Pirika) or prepared (Yubetsu) pressure platform were used. By way of disproving the former schemes, Hideaki Kimura's approach denies the role of nuclei and their production techniques for the dating of objects. Similar approaches were utilized by Naganuma Takashi. Hokkaido archaeologists identified Horoka, Togeshita, and Yubetsu types of cores within one stratigraphic unit and even within one concentration of artifacts. These facts challenge the universality of the typological and chronological approaches used earlier. Probably for this reason, a group of researchers, who in 1995 – 1999 conducted excavations at sites near Shirataki, rejected the previous criteria on which the detailed subdivision of the 20 – 12 ka BP period was based. Based on these considerations, we conclude: two technological approaches to microcore manufacture, based on blades and on bifaces, respectively, coexisted from the very beginning This opinion is shared by Hokkaido archaeologist, Terasaki (1999: 45 – 60). Upper Paleolithic industries differ mostly in the relative role of various microknapping techniques. The majority of microcore types appeared almost simultaneously, probably as early as 20 – 16 ka BP. The former developmental scheme applied to the lithic industries of Hokkaido was a rather simplistic postulation of the progressive development of technology from simple to complex. The periodization of the Upper Paleolithic of the Sakhalin–Hokkaido Peninsula suggested below takes into consideration both new and old data in cases where the latter have been corroborated by results of our current analysis.

Periodization and chronology of the Upper Paleolithic of the Sakhalin–Hokkaido Peninsula

The Upper Paleolithic sites of the first, earliest, stage of the paleopeninsula under discussion are represented by small collections of artifacts from the lower levels of sites in the Shirataki group and also by isolated finds from Ogonki-5 as well as by some artifacts from the upper layer of the Sennaya-1 site.We provisionally attribute all these sites and separate finds to the early Upper Paleolithic, their age being over 23 ka BP. The *terminus ante quem* for this period must be earlier than 30,000 BP. Such chronological estimates were obtained using the AMS radiocarbon method on samples derived from the underlying layer which contains no artifacts (37,350 ± 550) at the Kashiwadai-1 site and on one date generated on a sample from the culture-bearing horizon at Ogonki-5 (31,130 ± 440). The earliest date for the layer with tools at Kashiwadai-1 is 22,190 ± 210. Cultural materials are represented only by stone tools. Principal raw materials include chert, tuff, and basalt, and large blade flakes were used as blanks. The primary reduction process was based on parallel, unilateral and convergent flaking. Tools on flakes are typical of this stage. They include discoids and end-scrapers, microknives, microburins, and points. In their manufacture, unilateral percussion and pressure retouch is dominant. Some artifacts on large flakes from Ogonki-5 and from the upper layer of the Sennaya-1 site demonstrate reflections of technology characteristic of the Levallois tradition. Japanese archaeologists consider trapezoidal tools as a diagnostic trait of this early stage (Naganuma, 1998; 1999; Naganuma et al., 1999).

The second (Kashiwadai) stage defines the interval from 22 – 19.5 (19) ka BP. It is characterized by the predominance of the blade technique; microblade techniques were still unknown in the region. We attribute to this stage assemblages from Kami Shirataki-7 and 8 whose artifacts exhibit pronounced epi-Levallois traits such as Hirosato-type knives and tongue-shaped blades detached from technologically unsophisticated narrow-face flake cores. Artifact assemblages from the lower layers at Kashiwadai-1, Kamishihoro-shimaki, Sankakuyama, etc. are also representative of this stage. This industry is based mainly on local resources, but obsidian exchange may also have been practiced. Knives, typologically similar to Hirosato points, are found in the lower stratum at Ogonki-5 and at the Starorusskoe-3 (Chitinka) site. The chronological limits of this stage are defined by the results of chronometric dating (uncalibrated) from the Shin-Chitose group of sites (22,190 ± 210 – 20,140 ± 150), Marukoyama (21,940 ± 250), Sankakuyama (21,100 ± 700), and Ogonki-5 (19,380 ± 190 and 19,440 ± 140).

The third stage (Horoka or Ogonki) is dated to 19.5 – 16 ka BP and is represented by Ogonki-5 (dwellings from layer 3) and Urozhainoe-3 as well as by the middle layers at Kashiwadai-1, Shirataki-1 (Horokazawa), Tarukishi and others. Its lower chronological limit corresponds to the dates from layer 3 at Ogonki-5, and the upper one to dates on early tools from the Sokol site, determined by obsidian hydration. Both technologically and chronologically, this stage corresponds to the concept of "middle Upper Paleolithic." Sites of this stage are widely distributed across the southern part of the peninsula, located along the above-mentioned rivers on the basins of the seas of Okhotsk and Japan. The predominant site type is a settlement of two or three surface dwellings with pit hearths. The main innovations in the stone industry are the technologies of macro- and microblade production. Accordingly, typical features of this stage are the co-existence of a variety of narrow-face flake cores (e.g., large sub-prismatic-like, wedge-shaped, varying from macro- to microforms). Primary reduction was not dependent on nucleus size. Comparison of the morphologies of microblades, macroblades, and flakes indicates a high degree of similarity and the same methods of production. Raw materials were the more important variable, defining the size of the blank (depending on the original preform), its shape (depending on the structure of the raw material and its degree of plasticity), and the method of obtaining the desirable blank.

The Horoka–Yubetsu technological complex emerged at the beginning of the stage. The Horoka technique was dominant, with a blade technology retaining some early traditions (blades were thick, some irregular shape, particularly the tongue-shaped variety, and many were unretouched). Hirosato knives were still present in this assemblage. These features provide evidence of some cultural continuity either inside the territory under research or perhaps on a larger geographical scale. The characteristic types of lithic artifacts include macroblades as well as long, medium, and occasionally, short knife-shaped blades, including specimens exhibiting a diagonal burin spall removal. These assemblages also contain beak-shaped points; end-scrapers; microblades (usually irregular); wedge-shaped Horoka microcores; sub-prismatic narrow-face flake cores; wedge-shaped and discoid nuclei; adze-and-scraper-like tools; as well as numerous opportunistic tools (small saws, points, knives, burins, etc.) made on flakes, spalls, and fragmented blades. Blade truncation was often utilized in the reduction sequence.

Ogonki-5 and Kashiwadai-1, the key sites representative of this stage, are characterized by high concentrations of finds. Refittable artifacts allow the establishment of stable links between dwellings. It is logical to conclude that as early as 20 – 18 ka the peninsula was inhabited by humans who were well accustomed to life in the region. In the winter, they lived in surface dwellings composing seasonal camps in river valleys. During warmer seasons, they moved to the plain and to the seashore. Connections with the seacoast are suggested by amber nodules found at Kashiwadai-1 and Ogonki-5, i.e., at sites located far from the natural sources of amber. In the region under consideration, amber can be found only on several restricted stretches of ocean beach. On Sakhalin particularly, there are three main known sources of amber: one is located on the shore of the Terpeniya Gulf, near the mouth of the Naiba River, and two others are near Krillon Point. On Hokkaido, natural sources of amber are also scarce, and those that exist are mostly associated with coal deposits at Teshio River. To explain perceived patterns of seasonal migration, we should remember the need to hunt not only montane species but also larger animals that inhabited coastal tundra areas – such as mammoth (*Mammuthus primigenius*), elephants (*Elephant naumani*), bison (*Bison* sp.), and giant deer (*Megaloceros yabei*).

The peninsular human communities were certainly mutually related by stable exchange networks extending over a vast territory from the Ishikari Plains up to the Susunai lowlands. These relations were based on one of the most valuable natural resources of the region. obsidian collected from deposits in the southern part of the peninsula. Longitudinal seasonal migrations of herd animals were also important. Initially, obsidian did not play the crucial role that it did later, when both unmodified obsidian and obsidian tool blanks were wide spread across the peninsula. At this time, the second component of the technological complex in question reached its acme, supplementing and further developing the achievements of the Horoka technique of stone knapping. This new technique, known as Yubetsu, emerged about 16 ka BP, but reached maturity in the late Shirataki culture during the following, fourth, stage of the Upper Paleolithic of the peninsula.

The fourth (Yubetsu or Sokol) stage of the Upper Paleolithic in this region is dated by ^{14}C to 16 – 13 ka BP. It is represented by a large number of sites on both Sakhalin and Hokkaido, in particular by Sokol (the early complex), Urozhainoe-2, Horokazawa Toma, Shirataki-30 and 32, Kamioka 4, Pirika, and others. A wide variety of stone was used for the production of tools, although obsidian was predominant and apparently preferred. During this period, obsidian was transported in large quantities over distances up to 500 km from the source deposits. One may agree with R Morlan's opinion about the preservation of the Horoka technique down to 12,000 BP (Golubev, Lavrov, 1988: 209, 237). The long-term durability of this tradition is explainable by natural causes. Vein stone suitable for the production of large bifaces

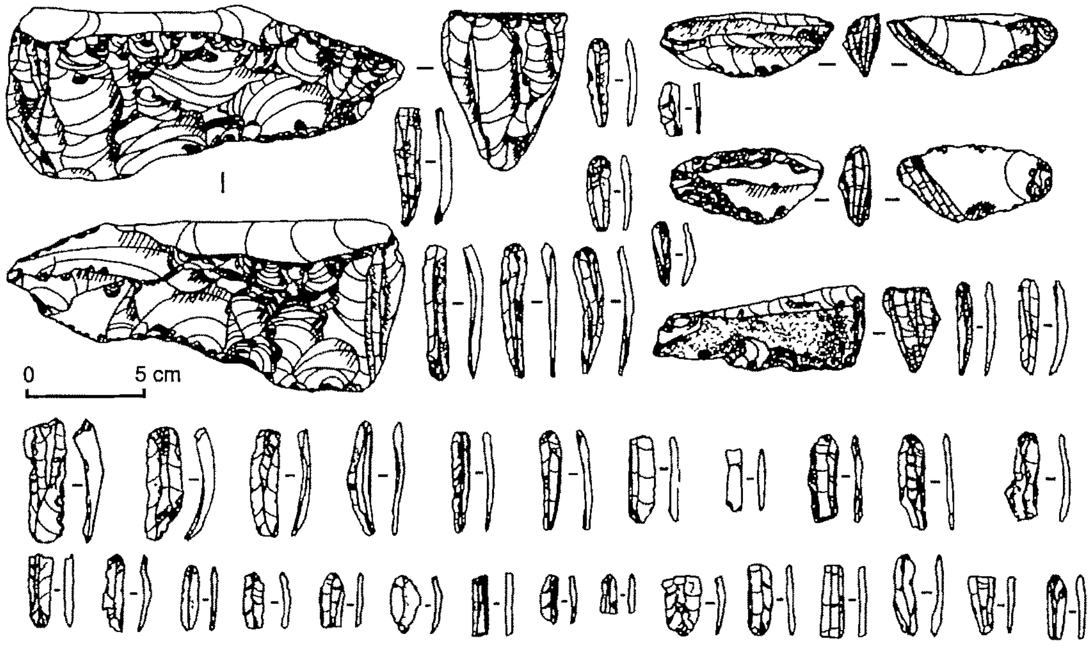

Fig 15. Obsidian cores and microblades from the Sokol site, Sakhalin Island. Surface finds

is rather scarce. It was therefore much more practical to use pebbles or blocks of rock which were abundant everywhere and widely used for production of tools using the Horoka technique. The stone inventory of this stage is characterized best by materials from the Horokazawa Toma H site. Several typical forms are known, including bifaces, wedge-shaped cores for microblades and blades, core performs made from boat-shaped blanks, prismatic, cylindrical cores for detaching blades, "primary" (boat-shaped) and "secondary" (ski-shaped) spalls, angle (Araya type) burins, burins with two facets similar to transverse burins, and side-scrapers on flakes and blades, as well as macroblades and, more rarely, long and medium blades ranging from 10 to 20 cm long, and 3.5 to 7 cm wide.

It should be born in mind that Horokazawa Toma is a workshop site. Based on the composition of its lithic inventory it is, of course, different from habitation sites of this period. However, the techniques of flaking are well illustrated by the artifacts recovered from this site. The site was evidently focused on the production rather than the use of tools. To the contrary, in the early complex of the Sokol site, finished artifacts with traces of use are mostly present: the same nuclei as those from Hokkaido sites, but smaller in size, and similar blades and microblades (Fig. 15). However, crested and ski-shaped spalls are virtually absent, although burins, end-scrapers, side-scrapers, other tools, and exhausted cores are well represented. At Sokol, unlike Ogonki-5, heavy bifaces and wedge-shaped cores were recovered. This is evidence of the orientation toward other kinds of raw materials and of a later stage in the development of this industry. On Sakhalin, the transition from the Horoka technique to predominant use of the Yubetsu technique is marked by the beginning of the intensive use of obsidian resources on Hokkaido and by an increase in the size of the resulting cores. Simultaneously, the microblade technique became widespread and developed, although the technique of blade production was not abandoned. Extensive variability that is typical of this series should be noted: while somewhat amorphous macroblades (15 – 25 cm) and long (13 – 15 cm) blades (Ogonki-5) dominated assemblages of the third (Ogonki) stage, long, medium (7 – 12 cm) and small (5 – 6 cm) blades dominated the fourth (early Sokol) stage on Sakhalin. The continuation of the use of macroblades in Hokkaido sites of this type is explainable by taking into account the rich deposits of raw material that existed in this area. In addition, late macroblades occur in regular forms that distinguish them from those of Ogonki.

This stage is defined chronologically by dates from the Sokol site (16 – 12 ka BP) and by the formation of the La Pérouse Strait (13 – 12 ka BP). Intuitively, the latter event should have disrupted the continuity of the region, but actually its consequences were precisely the opposite. It was after the formation of the strait that the exchange of raw materials between these territories intensified and remained so until the emergence of a developed Neolithic adaptation, i.e., until the

5th millennium BC (Vasilevski, 1993: 56 – 69). Because the problem of the boundary between the Upper Paleolithic and the Neolithic is not addressed in this paper, we will confine ourselves here to this general observation.

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HEARTHS AT THE PODZVONKAYA PALEOLITHIC SITE: EVIDENCE SUGGESTIVE OF THE SPIRITUALITY OF EARLY POPULATIONS OF THE TRANS-BAIKAL REGION

Introduction

Current research trends in the Paleolithic studies have the major objective of providing answers to questions concerning the time of origin, characteristic features and developments of Stone Age archaeological cultures. Apparently, priority is given to the studies of the morphology and typology of stone tools as well as to the technology of their production. The apparent predominance of this trend is stipulated by the fact that lithic artifacts represent the principal and, in most cases, sole items of anthropogenic origin at the majority of Paleolithic archaeological sites. Other information, including that of the original conditions of artifact deposition within soft sediments, is often missing due to natural, primarily geological processes. The overwhelming majority of Paleolithic sites older than 20,000 years are located on piedmont shelves, alluvial fans, and terrace-like escarpments of mountain slopes. Because they are located in these geological contexts, a considerable number of archaeological sites have been impacted by the destructive influence of denudation processes. In such situations, detailed studies of the preserved structural elements of occupation sites have gained special importance. The whole diversity of structural elements can be subdivided into simple (hearths, spots of burned soil, household pits, hoards, dwelling zone pavements, refuse pits, stone and bone knapping zones, ash concentration zones, etc.) and complex (dwelling places possessing a combination of simple elements) features.

Studies of these elements allow researchers to reconstruct the original structural patterns at Paleolithic sites This research can also provide information on the behavioral strategies of early populations, not only with respect to economic activities, but also in the spiritual sphere.

In 1991, the Podzvonkaya Paleolithic site was discovered in the eastern part of the Kyakhta Region of the Buryatia Republic. Podzvonkaya revealed well-preserved structural elements of the spatial organization of an ancient occupation site. At first, the site consisted of a rather small area that yielded archaeological materials attributed to the Upper Paleolithic. The site is located in an amphitheater formed by the hills on the left bank of the narrow valley of the Tamir River in the western ranges of the Tamir Mountain Range (Fig. 1). Archaeological excavations carried out from 1991 – 2000 revealed that the site is wider than the initially established area of 100 × 50 m (Tashak, 1996). At present, the entire territory of the south-facing piedmont shelves, ranging from the floodplain to the eastern slopes of the amphitheater, has been identified as the early Upper Paleolithic occupation zone (Tashak, 2002). The total area of the site is divided into several portions by the topography of the amphitheater. In total, four loci with stratified archaeological and paleontological materials have been investigated. These loci have been designated as the East, West, Southeast, and Lower Complexes. The East and Southeast Complexes are of major interest in the studies of spatial patterning of an early occupation site. The present paper focuses the attention of the reader

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Fig 1 Western view of the Podzvonkaya site

on hearths and spots of burned soil from culture-bearing horizon 3 of the East Complex. The author provides an interpretation of specific features of hearths and associated osteological materials in their archaeological contexts.

Structural elements within culture-bearing horizon 3 of the East Complex

Culture-bearing horizon 3 was established over an excavation area of 25 sq. m within the East Complex at Podzvonkaya. Preliminary analysis of the stratigraphy and horizontal spatial distribution of artifacts has shown that the occupation area was situated on a slightly dipping surface of the piedmont shelf. To the south, the area is delimited by an ancient linear depression formed between two piedmont shelves.

Within the excavated area, culture-bearing horizon 3 is subdivided into the southern and northern parts by a smooth escarpment 15 – 25 cm high. The thickness of this culture-bearing horizon varies from 20 to 30 cm in the northern part and from 50 to 60 cm in the southern part of the area. The southern part revealed a sequence of ash laminations, while the spots of ash noted in the northern part are scarce and did not penetrate deeply into the soil. The archaeological content was dispersed unevenly over the excavation area, with the majority of finds recovered in the southern part. Culture-bearing horizon 3 yielded abundant collections of lithic artifacts (about 5 thousand specimens) and animal bone remains (more than 5 thousand fragments). Small unidentifiable bone fragments constitute the majority of horizon 3 bone collection. The surface of this culture-bearing horizon showed signs of numerous disturbances, both ancient and more recent, some having occurred soon after the site was abandoned. These disturbances are represented by small gullies filled with a mixture of ash and soil, animal bones, and lithic artifacts. Also, this culture-bearing horizon was altered by solifluction and by other cryogenic processes after deposition. Ice-clefts originating from the overlying lithological horizons were not considerably deep and did not cause severe disturbances in the culture-bearing horizon. Solifluction processes caused extensive soil shifts, which disturbed the uppermost portion of the culture-bearing horizon. As a result of this instability, some of the archaeological and osteological materials shifted downslope. Structural elements of an early human settlement were uncovered within the middle and lower portions of this horizon. The structural elements include dense concentrations of lithic artifacts surrounding large stone slabs, regarded as zones where stone knapping and tool manufacturing took place (working zones), ash concentrations, and hearths.

A total of five hearths and spots of burned soil were noted at the East Complex (Fig. 2). Three of these hearths represent complex constructions comprising a sequence of several simple fireplaces. Separate fireplaces in such a sequence may represent a hearth with a pavement and several stones in the vicinity to the hearth, or simply a spot of burned soil without any artificial constructions.

Hearth 1 was uncovered in 1997 on the border of quadrants B-3 and B-4 of the established grid system. This hearth is a single-layer fireplace, 0.9 × 0.65 m, with a stone pavement made of two stone slabs of granular texture. A large rock fragment (Fig. 3) overlaid the hearth along its long axis in a NE – SW orientation.

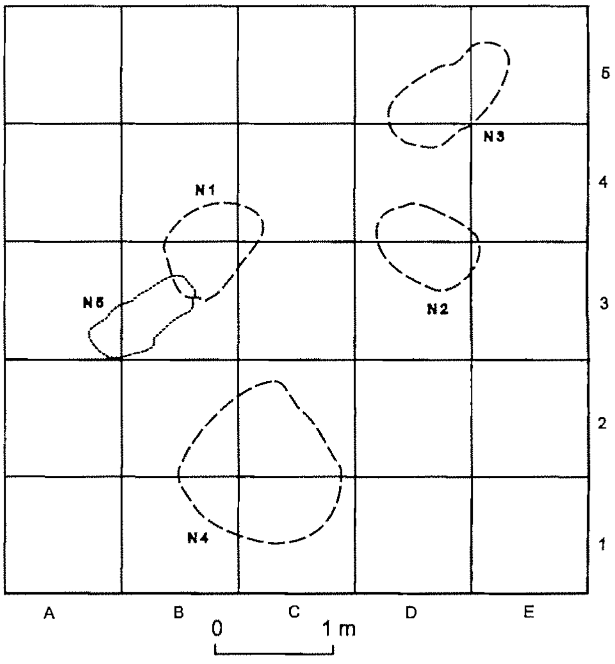

Fig 2 Plan map showing the location of hearths within the East Complex (upper level)

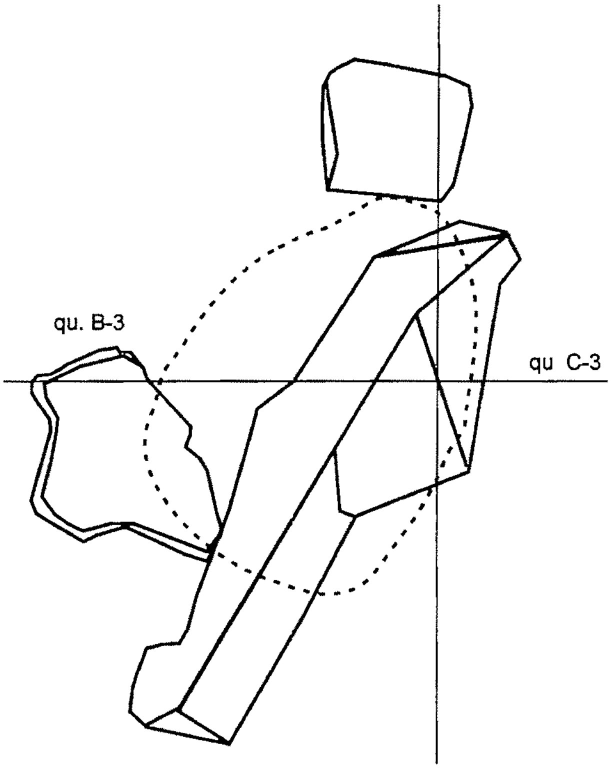

Fig 3. Hearth 1 with fire pit covered with a stone slab.

Fire was generated in a hollow, oval, probably artificial pit up to 10 cm deep. When the hearth ceased to be used as a fireplace, its central area was cleaned of combustion products down to the level of the deep red-colored burned soil at the bottom of the pit. A scapula of a large animal, probably a deer, was placed over this burned soil with its flat surface facing downward. A scapula of a smaller animal (roe deer?) partially overlapped the deer scapula and partially rested on the burned soil. This smaller scapula was punched through with a point made from the vestigial metapodial bone of a horse. The point was broken probably as a result of a blow or due to the pressure imposed on the contents of the hearth pit by the slab covering the hearth. Next to the scapulas, a segment of a deer spinal column in anatomical order, the anterior portion of a horse mandible, and an epiphysis of a long bone were found (Fig. 4) The pavement stones and the covering slab were fissured. It seems that the rock texture was affected by repeated heating by fire, while subsequent mechanical and chemical forces completed the process of decay. Other stones recovered from the excavation area but not in association with the hearths did not show such signs of decay.

Remains of a fireplace that seems to have had a stone pavement, designated as Hearth 2, were noted at 1.5 m east of Hearth 1, on the border between quadrants D-3 and D-4 and partially overlapping quadrants E-3 and E-4. This fireplace was severely damaged by washout processes because it is located on the escarp subdividing the excavation area into its southern and northern parts. This hearth was constructed in a similar manner to Hearth 1: a hollow pit with burned soil at the bottom. This hearth has two levels. The hollow of the first level contained an insignificant amount of ash and charcoal pieces mostly along the margins. However, due to the bad state of preservation of Hearth 2, it is not possible to determine if the bottom of Hearth 2 was cleaned in the same way as in Hearth 1. The most important feature of this hearth is a segment of an animal spinal column recovered in anatomical order. The hearth was partially covered by a large stone slab that might have been a part of a stone pavement. The eastern part of the fire pit was washed out. The size of the hearth is provisionally estimated at 0.9 × 0.6 m. The second level of Hearth 2 comprised an oval hollow up to 10 cm deep with clear borders. The soil at the bottom of the hollow was intensively burned. The hollow contained a few charcoal pieces and ash.

Fig 4. Hearth 1 showing the *in situ* location of objects.

Hearth 3 was established 0.9 m to the north of Hearth 2. The eastern part of this hearth was destroyed: rocks of the pavement have shifted into the fire pit and the northeastern margin of the hearth is partially washed out and deformed. However, in general, this hearth is in a better state of preservation than Hearth 2. Two large rocks at the southern and northeastern portions of the hearth might have been parts of the pavement. The well-preserved part of the fire pit of Hearth 3 had been cleaned of ash and charcoal. A scapula of a large animal, probably a horse, was laid on the surface of the red burned soil, and leg bones of an artiodactyl were recovered in anatomical order from the center of the pit. The hearth's dimensions, 1.2 × 0.6 m, have been determined based on the area of dispersal of the burned soil and ash spot with charcoal. The long axis of this hearth is oriented to the ENE – WSW line.

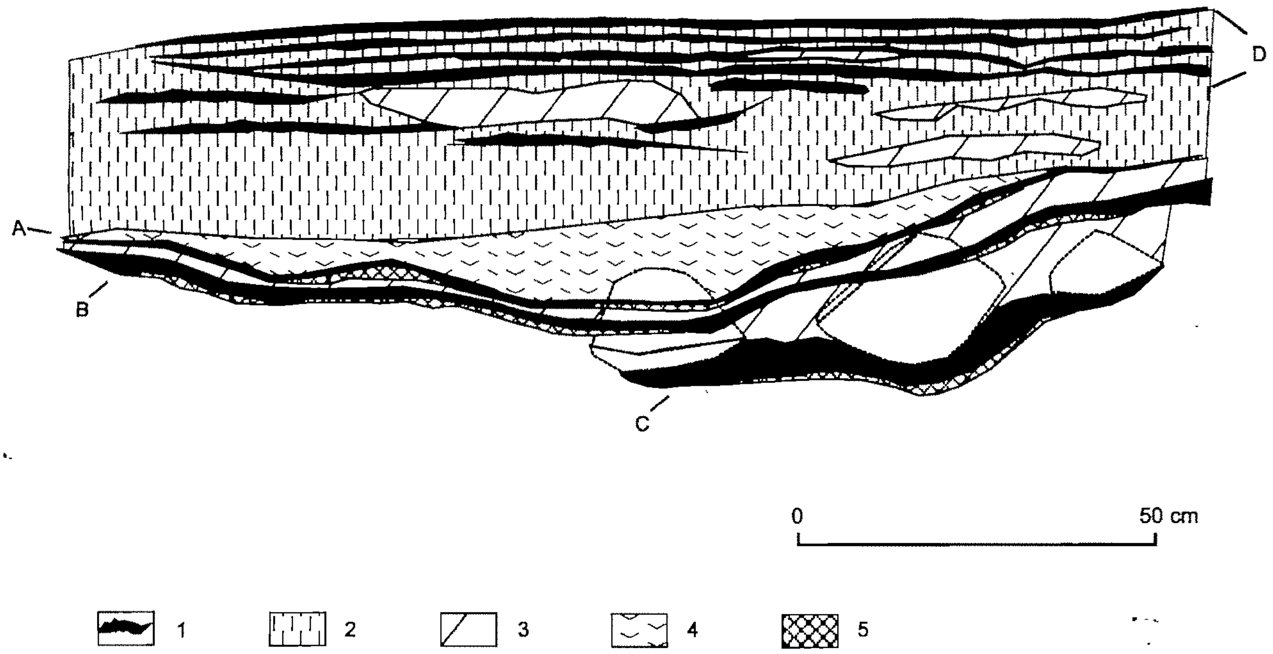

Fig 5. Stratigraphic profile along the E – W line of multilayered Hearth 4 and overlying laminations of ash and charcoal
A – upper level, B – middle level, C – lower level, D – ash and charcoal laminations *1* – ash and charcoal laminations,
2 – culture-bearing horizon, *3* – sterile layer of loam, *4* – ash filling of the fire pit of the upper level,
5 – area of burned soil beneath the fire place.

Hearth 4 was established at the junction point between quadrants B-1, 2 and C-1, 2. In the course of the excavation of these quadrants, thick laminations of ash and charcoal were noted throughout this area. These laminations were bisected by micro-gullies suggestive of washout processes. Beneath the layer of soft sediments containing ash and charcoal, a multilayered hearth was found (Fig. 5). This hearth was buried in antiquity and contained a circular pit about 1.5 m in diameter. The upper level of this hearth contained a lens of ash and charcoal overlying bright spots of burned soil. Large stones were shifted into the center of the hearth due to post-depositional processes. Some of these stones might have been elements of the hearth pavement. In the center of the ash-charcoal lens, two fragments of extremities of some small animal were found in anatomical order. The middle hearth level was separated from the upper level by a lamination of well-washed loam. The thickness of this loam lamination varies from 1 cm in the center to 7 cm at the margins. The middle hearth level revealed an oval-shaped lens of ash and charcoal overlying burned soil, with dimensions of 1.2 × 0.90 m. In the center of a cup-like hollow, three stones strewn with ocher powder were noted. The lower level of Hearth 4 represents a "classical" hearth shape surrounded by stone pavement. This oval-shaped construction is 0.85 × 0.5 m, and its long axis is oriented along the NE – SW line. A large rock fragment occupied the area inside the stone pavement, apparently placed there when the hearth was no longer in use (Fig. 6, 7).

Hearth 5 was established within quadrants A-2, 3 and B-2, 3. This hearth also contained several levels. The upper level consisted of a flat and oval lens of ash and charcoal, 0.5 × 0.45 m. Two stones at the eastern and northern sides of the hearth comprised the pavement (Fig. 8). The middle level of Hearth 5 was not even. In the middle it joined the upper level, its margins abruptly dipped to the lower level and coincided with the edges of the latter (Fig. 9). The middle and lower levels of Hearth 5 were thin charcoal lenses overlying bright reddish-brown spots of burned soil. The sizes of the fireplaces are 0.9 × 0.45 m, and their long axes are oriented along the NE – SW line. In the southwestern portion of the area of burned soil, the middle level was positioned 15 cm above the lower level (Fig. 9). These two levels were separated by a layer of ash and charcoal. A zone of slightly burned soil stretched to the southeast (Fig. 10). In accordance with the boundaries of this spot of burned soil, the dimensions of the lower level of Hearth 5 have been established at 0.9 × 0.6 m.

A large and flat river pebble was recovered from the concave bottom of burned soil. On the upper side of the pebble powdered with ocher, a tibia and a vestigial metapodial of a horse were placed in anatomical order. To the north of the pebble, a rib of an animal (deer?)

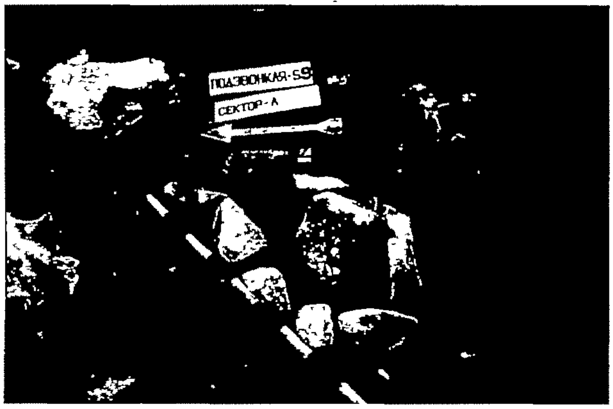

Fig 6 Lower level of Hearth 4 Large stone in the center of the stone pavement

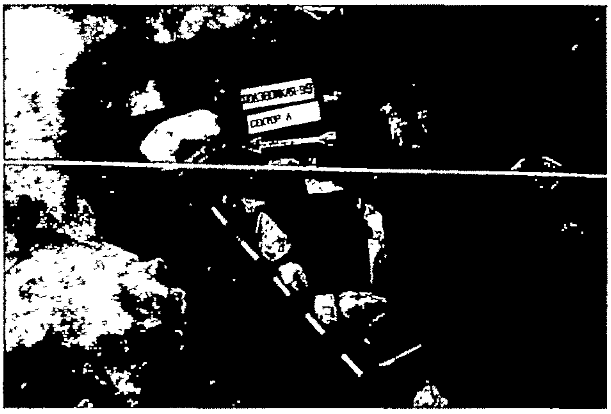

Fig 7. Lower level of Hearth 4. Stone pavement upon removal of the stone covering the fire pit

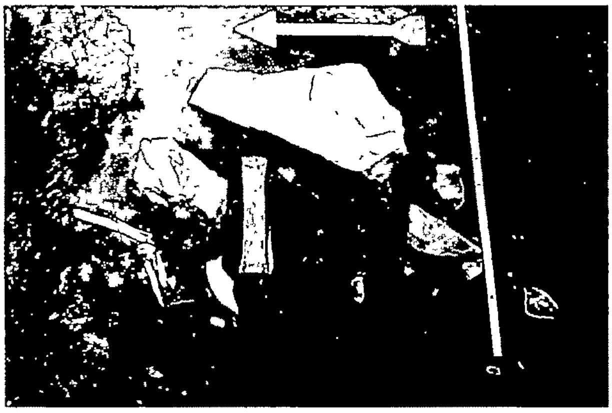

Fig 8 Hearth 5. In the central portion, the hearth is excavated to the lower level containing a flat river pebble and a tibia of an artiodactyl on the pebble.

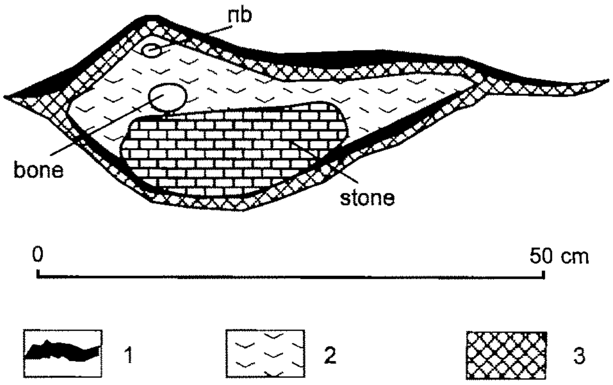

Fig. 9. Stratigraphic profile of the middle and lower levels of Hearth 5 (along the N – S line).
1 – layers containing charcoal, *2* – ash filling between the middle and the lower levels; *3* – burned soil beneath the fireplace

was found, rising like an arch over the surface of the lower level of Hearth 5. The lens of charcoal and burned soil of the middle level was 1 to 1.5 cm above the rib, so it was not affected by fire. The upper surface of the rib displays four deep transversal incisions made with the help of a stone tool and a series of small scratches, which may be the result of natural processes. Also, a deer rib fragment bearing a series of regular incisions was recovered in the southeastern part of the lower level of Hearth 5.

The spatial characteristics of Hearths 1 and 5 are noteworthy. On a horizontal plan they join one another, while in the vertical projection, they are separated by a thick layer of soil. This fact suggests that the hearths were used during different periods of time.

Data on the stratigraphic locations of the hearths and their construction features suggest certain inferences about the periods during which each particular hearth was built and the site was occupied. Culture-bearing horizon 3 of the East Complex has been regarded as a continuous layer though partially disturbed through slope shifting processes. It is important that available data allow us to infer on the periodic pattern of accumulation of this horizon. Discrete usage of Hearths 2, 4, and 5 is apparent based on their stratigraphic positions. The most vivid evidence of such a discontinuity has been revealed by the stratigraphy of Hearth 4, where three individual hearths are separated from one another by sterile layers. The sterile loam layer between the lower and middle levels suggests a short-term accumulation period. Most likely it took place within a single generation. Our observations that were carried out in the course of excavations have shown that a layer of clayey soil 0.5 – 1.0 mm thick accumulated on the floor of the excavation area during 3 or 4 hours of raining. In hollows, the relevant layer reached 1.5 – 2 mm. Hence a series of heavy rains might have lead to accumulation of such sterile layers 1 – 2 cm thick during one season. When people

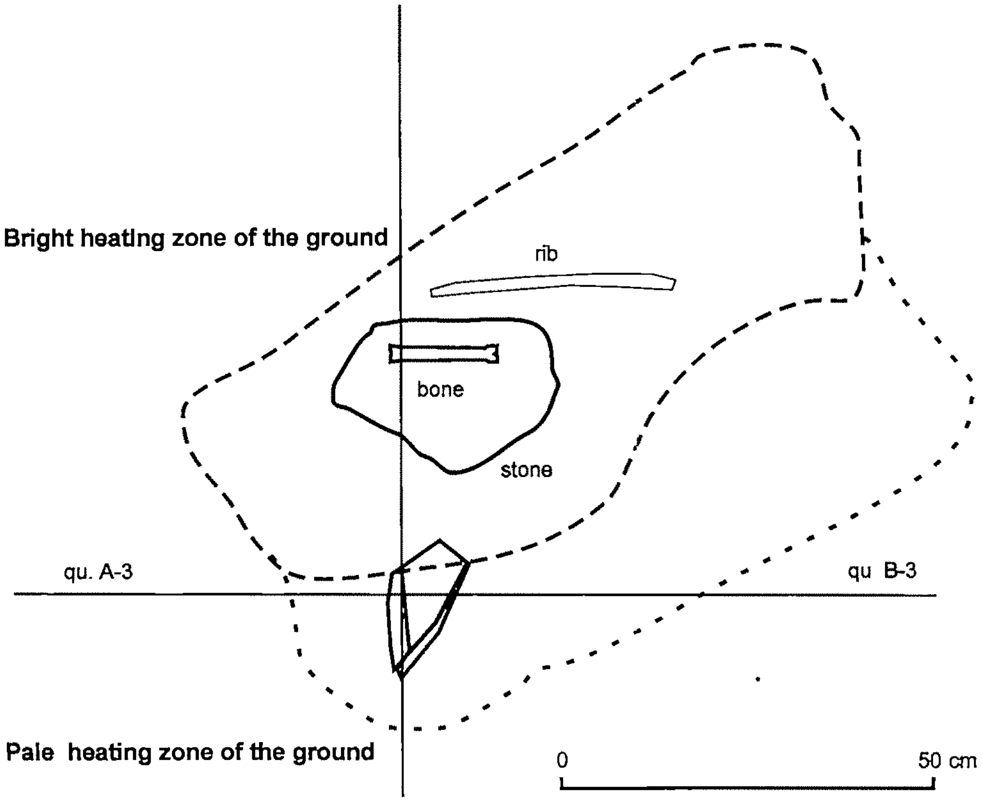
Bright heating zone of the ground
rib
bone
stone
qu. A-3
qu B-3
Pale heating zone of the ground
0
50 cm

Fig. 10 Plan map of burned soil areas beneath the fireplace of the lower level of Hearth 5.

returned to the site, they soon trampled down this sterile layer, which became mixed with the previous culture-bearing deposits throughout the entire living zone. Sterile layers were preserved only over the areas where nobody walked: under the hearths and fireplaces.

The vertical disposition of Hearths 1 and 5 suggests that a longer time period passed between their constructions. In the course of excavations, laminations of ash and charcoal were noted over Hearth 4 and partially over Hearth 5. These laminations have been identified as dump resulting from repeated cleaning of Hearths 1 and 2. This means that when Hearth 1 and the upper level of Hearth 2 were used, Hearths 4 and 5 had been buried in soft sediments. It is noteworthy that no such dumps of ash and charcoal have been noted northward from Hearths 1 and 2.

Studies of the hearths as structural elements of the East Complex at Podzvonkaya have shown that not all the constructions were synchronous. This fact does not allow us to identify this Complex as a large occupation site with numerous hearths as has been reported at some other late Middle – early Upper Paleolithic sites in Eurasia.

Hearths as objects of ritual behavior

The reconstruction of the social community and perception of Nature of Paleolithic humans is a more complicated task than the reconstruction of their economic activities. However, it is possible on the basis of available material evidence. Syncretic perception of the environment by early humans was reflected in various rituals and ceremonies. Apparently, the early features of ritual behavior reflect the process of the appearance of a religious consciousness: religious beliefs have always been bound with certain rituals, i.e., cult or magic practices (Tokarev, 1990: 383).

Specific features noted in association with hearths and filling of the hearth pits within culture-bearing horizon 3 of the Podzvonkaya East Complex suggest the existence of spiritual aspects in the behavior pattern of early populations of the West Trans-Baikal because they represent human activities not related to the primary purpose of the hearths. I believe these features reflect ritual behavior suggestive of the performance of certain cult activities.

Let us single out the whole complex of elements and other evidence that is not related to utilitarian role of the hearths.

1. The pits of Hearth 1 and 3 were cleaned from ash and charcoal. Nearly the entire floor of Hearth 1 is clean, while only the southwestern portion of Hearth 3 is clean. The cleaning of ash from hearths is an ordinary thing; however, in our case, the hearths were cleaned at the end of their use.

2. Animal scapulas were laid on the clean floors of burned soil in Hearths 1 and 3.

3. Hearth 1 and the upper level of Hearth 2 have revealed segments of animal spinal columns in anatomical order. Hearth 3 and the upper level of Hearth 4 have yielded bones of animal extremities in anatomical order. This was possible only when the bones were articulated, i.e., the bones bore flesh. Apparently, hearth pits may contain some accidental things including animal bones, given that the site was occupied when the hearths were no longer used. However, it should be noted that outside the hearth pits, animal skeletal parts in anatomical order have not been noted. Additionally, the bones from the hearths did not demonstrate signs of burning. Burned bones have been recovered only from ash dumps at the site.

4. A tibia and a vestigial metapodial of a horse were laid in correct anatomical order on a large flat water-worn stone in Hearth 5. The bones seem to have been connected by soft tissues at the moment of deposition.

5. The lower level of Hearth 5, the middle level of Hearth 4, and Hearth 3 have contained rocks powdered with ocher. All the stones show signs of use preceding their placement in the hearths. The large pebble from Hearth 4 was likely used as a "fire pan", a nearly square-shaped fragment of similar pebble from Hearth 3 served as an anvil, conical-shaped stones from Hearth 4 represent grinding and hammer stones.

6. When they were no longer in use, the hearths were covered with big stones. Such features have been noted in Hearth 1 and in lower level of Hearth 4. A large rock fragment partially covering the upper level of Hearth 2 and a small slab occupying the center of Hearth 3 seem to have played the same role. The deer rib from the lower level of Hearth 5 likely performed a similar function.

This list does not contain unique features. Each feature has been repeated at least twice. The only exclusion is the deer rib from Hearth 5, but its position is so specific, that there are no doubts in its premeditated character.

The noted combination of features related to hearths suggests a definite sequence of actions performed by the early inhabitants of this site that can be interpreted as a ritual of burying the hearth upon termination of its normal use. Hearth centers were covered with large rocks and animal scapulas and the ritual of tribute of articulated animal bones with flesh was performed. The sacrificial parts did not contain much flesh; the required act was performed without a considerable waste of food. Occurrences of ocher on stones intentionally laid in hearths represent another characteristic feature of the hearth-burying ritual. And finally, when a new hearth was arranged at the same place, the old hearth was not re-used.

Such a hypothesis is supported by the following facts. The majority of works highlighting spatial organization of living and activity zones within Paleolithic culture-bearing horizons stress the fact that archaeological materials are concentrated around hearths representing centers of living activities of early populations. In all appearances, such a definition of a role of hearths has rested on solid ground. At present, the rituals of fire worship have been widely practiced by indigenous peoples of Central, North, and Northeast Asia. In religious systems of these peoples, fire in a hearth is perceived as a part of the Heavenly Fire and is therefore considered sacred (Galdanova, 1987). Fire is considered to be a purifying and protecting substance providing people with prosperity and a life force under the condition that they perform certain ceremonies (Tsybikov, 1991. 162 – 163). On the other hand, peoples of Mongolia, for instance, worship specifically hearth fire rather than fire in general. Only hearth fire is fed with pieces of meat and drinks as part of a sacrificial treatment. In traditional religions, hearths are regarded as "masters of fire" and components of fire worship (Mikhailov, 1987: 75). The Chukchi fire cult is considered archaic. During the fall butchering session, the Chukchi used to throw pieces of meat into family hearths (Tokarev, 1990: 592).

Rituals of this sort are widely known and rooted in the remote past. However, such practices do not leave material evidence. For the Stone Age, additional data are necessary.

Figurines of females, the Paleolithic "Venuses", are considered representations of hearth cult in the Paleolithic. Tokarev (Ibid.: 555) interpreted these figurines as the "keepers and mistresses of hearths." If we agree with the proposed interpretation, we have to recognize that a hearth, which had a "keeper" and a "mistress" was an honored place. In fact, adding sacred features to hearths began as early as in the Middle Paleolithic. For instance, the archaeological site in Veternica Cave, Croatia, yielded three skulls of cave bear, two of which were intentionally placed in rock niches, while the other one was laid in a hearth (Sklenarj, 1987: 169). Such skulls placed in rock niches and in hoards made in rocks represent a characteristic feature of many archaeological sites in mountainous regions of Europe. They are regarded as evidence suggesting the existence of a cave bear cult. The mentioned case is interesting as the hearth was regarded as equal to the niches. Placement of a bear skull in that hearth added specific sacral status to the hearth.

The majority of Paleolithic hearths reported from Europe and Asia have yielded various artifacts. However, the question of how they appeared in hearths is still unclear. In this respect, two hearths uncovered at Pushkari-1 site, the Ukraine, are noteworthy. Animal bones were driven into the ground in the very center of each hearth: a burned mammoth bone in one and a rib in the other. The latter hearth also revealed two bones at the margins (Boriskovskiy, 1953: 188 – 189). The bones at the periphery of the hearth might have served as poles holding a spit over the fire. However, the central rib was placed in the center of the hearth upon extinguishing the fire. If the mammoth bone from the other hearth had been placed in fire, it would have been there for only a short time, or otherwise it would have been completely burnt out.

A whole set of fragmented zoo- and anthropomorphic fired ceramic figurines has been reported from a hearth at Dolni Vestonice II (Jelinek, 1982: 231). Even if the site was used as a workshop, it is noteworthy that the figurines were placed in the hearth rather than by it or scattered in disorder. Boriskovskiy (1953: 248) reported a whole set of unique finds. "bone tools and pieces of art" from hearths at Mezin site, the Ukraine; some objects of this set were placed in the hearths after the hearths were no longer in use. We believe that some items might have been placed in the hearths intentionally.

Conclusions

The data discussed in the present paper suggest two major conclusions.

1. The Podzvonkaya Paleolithic site was repeatedly occupied by humans, possibly representing a seasonal camp. The noted structural elements of the site allow us to infer that representatives of a single population group inhabited this site during several seasons. The Podzvonkaya site was occupied for a rather long period in the early Upper Paleolithic, during which the earlier structural elements were covered by refuse left behind by succeeding generations of inhabitants.

2. The repeated recovery of finds demonstrating features, either identical or similar in particular aspects, from hearths and fireplaces at Podzvonkaya together with specific features of deposition of the artifacts suggest their premeditated placement into the hearths. This fact is suggestive of intentional actions performed by Paleolithic humans with respect to hearths and fireplaces when they were no longer in use. Apparently, these actions were ritual and were aimed at places of burning fire rather than at the fire itself, because some bones and skeletal fragments were placed in hearths after the fire was extinguished.

The abovementioned materials recovered from the hearths and fireplaces from the East Complex at Podzvonkaya are not unique evidence of early ritual behavior in Trans-Baikal. For instance, the Paleolithic site at Varvarina Gora yielded a cult burial of animal bones: a skull of a carnivore and horse bones were recovered from a small pit with a stone pavement at the bottom (Okladnikov, Kirillov, 1980: 32). These facts allow us to infer that Paleolithic humans felt the necessity to comprehend the phenomena of the surrounding world and tried to establish a relevant behavior strategy in the form of spiritual interrelationships with this world.

Let us propose a chronological estimate of the period of hearth use during which the rituals of hearth cult were performed. The Podzvonkaya lithic industry is based on the sub-prismatic and prismatic stone reduction strategy with a considerable proportion of Levallois flaking Available archaeological materials illustrate a trend of development of the Upper Paleolithic tool types (lateral *racloirs*, knives, points on blades, burins, and adzes). The set of distinctive Middle Paleolithic tool types includes *déjeté* side-scrapers, asymmetrical Mousterian points, etc. The noted combination of the major tool types suggests an early Upper Paleolithic attribution of the site. Available radiocarbon dates do not contradict such age estimations A date of 38,900 ± 3300 BP (AA-26741) has been generated on a bone sample from the lithological level containing Hearth 1 of the East Complex. This date is well correlated to a series of dates from other Complexes at the site and dates the whole site back to about 40 ka BP. In this case, the site is one of the oldest representations of the hearth cult and ritual actions aimed at hearths that occurred in the southern West Trans-Biakal in the early Upper Paleolithic.

Archaeological investigations carried out at other portions of the Podzvonkaya site have revealed hearth cult representations similar to those noted at the East Complex. Other excavation areas have shown a poor state of preservation of layers containing archaeological materials. For instance, the Southeast Complex revealed hearth remains destroyed by solifluction processes. The hearth possessed a pavement of water-worn stone slabs and yielded a fragment of a horse mandible and bones of an extremity of an artiodactyl. The extremity bones were grouped together, and some of them preserved anatomical order. Similar finds were recovered from the Lower Complex. Thus, the evidence suggests a single cultural tradition.

Such an inference is based not only on the data obtained through morphological and technological analyses of lithic artifacts, but also on the features reflecting spiritual aspects of behavior of the Podzvonkaya population.

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THE METAL AGES

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CHRONOLOGY OF EARLY IRON AGE BURIAL ASSEMBLAGES IN THE UPPER OB REGION BASED ON THE TREE-RING AND RADIOCARBON METHODS: BYSTROVKA-2 BURIAL GROUND*

Introduction

Since the publication of the monograph *History of Ancient Tribes of the Upper Ob Region* by Gryaznov (1956), issues concerning the absolute and relative chronology of the Early Iron Age sites in this region have been discussed by several generations of archaeologists. The argument became quite heated in the 1980s, and is still far from being resolved. The discussion has passed through several stages (see (Troitskaya, Borodovsky, 1994) for a review).

The beginning of the recent stage was marked by the monograph *Bolsherechenskaya Culture in the Forest-Steppe of the Ob River Region* by Troitskaya and Borodovsky (1994). The integration of materials from recent excavations in the Upper Ob River and the application of Gryaznov's typological scheme to incompletely published assemblages spanning the distance from Biysk downstream to Kamen-na-Obi have triggered new disputes involving the Early Iron Age of the Upper Ob. The publication of the larger part of the database has provided new arguments for the participating scholars (Pogrebalny obryad..., 1996). Some tentative results were reported in a number of papers delivered at a conference focusing on the Scythian period in the Altai (Barnaul, 1999), and at the 12th Archaeological and Ethnographical Conference in Tomsk (2001). The present article addresses exclusively matters of chronology.

Since the mid-1950s, chronological estimates for the Early Iron Age of the Upper Ob region have been mostly based on the archaeological analysis of the

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artifacts and, to some extent, on the chronology of the burial rite. At the early stages, this was believed to be a respectable approach; indeed, it was elaborated upon in the late 1800s and early 1900s and has been tested by many researchers. In fact, until the end of the 20th century, this was virtually the only methodology possible since the number of radiocarbon dates for the Early Iron Age of the Upper Ob was quite small (Orlova, 1995b: 209; 1998: 75). As an example, we may cite a single radiocarbon date for Yeluninsky II mound 1, obtained in the late 1970s. Kiryushin and Frolov (1998) assess its reliability using the sole criterion of agreement with the artifact typology. In their words, "...the suggested chronological estimate [based on artifacts] is not contradicted by the radiocarbon date of Yeluninsky II mound 1: 560 ± 25 BC" (Ibid.. 124). Importantly, the date is uncalibrated. The estimate published by Orlova (1995b: 209) is 2510 ± 25 BP (SOAN-1923), which, after calibration, yields a confidence range of 790 – 520 BC ($\pm 2\sigma$). The interval is wide enough to encompass very diverse archaeological phenomena.

In a classification of the 1st millennium BC sites, recently published by Kungurov (2001: 294 – 295), the single uncalibrated date cited above is used to support the proposed chronology. The reasoning is standard. if the date does not contradict archaeological criteria, then it can be regarded as valid (or supportive or correct or accurate)

Clearly, individual radiocarbon dates can hardly be regarded as conclusive evidence Reliable conclusions can be drawn only from series of dates concerning well stratified archaeological sequences including the funerary assemblages. This principle motivated the choice of samples for radiocarbon and dendrochronological analyses from an Early Iron Age burial ground at Bystrovka, Iskitim District, Novosibirsk Province (Borodovsky, 2000: 14).

Materials and methods

The Bystrovka burial ground group: A brief description

Bystrovka is a large burial ground dating from the Berezovsky stage of the Early Iron Age (last third of the 1st millennium BC). It includes several non-contemporaneous mound groups, termed Bystrovka-1, 2, and 3 (Borodovsky, 2000: 14), and is situated on the right bank of the Ob River, 90 km southeast of Novosibirsk (Troitskaya et al., 1980: 39) (Fig. 1, 2). A notable feature of this site is that most mounds include several graves (Bystrovka-2, one to eleven; Bystrovka-3, one to thirty-nine; Bystrovka-2, nine to thirty-eight) (Fig. 3).

Bystrovka-1 was generally dated to between 300 – 100 BC based on the artifacts, although certain objects may date from 600 – 300 and from 400 – 200 BC (Troitskaya, 1983: 42). Bystrovka-3 was believed to be no older than the late 2nd century BC (Troitskaya, Borodovsky, 1994: 22) or the 1st century AD (Durakov, Mzhelskaya, 1995: 54 – 55) using the same criteria, although the assemblage included metal buckles of the Tes type, which circulated in AD 100 – 400, and tiered-socketed antler points similar to those of the Verkhneobskaya Culture (AD 100 – 500) (Hudiakov, 1986: 114, fig. 50, *1*; 115, 118, fig. 52, *1*). The assemblage from Bystrovka-2 (iron ringed knives, an iron dagger with pseudo-ringed head, iron ringed bits with rod-like cheek-pieces, iron spatula-shaped pendants, a belt hook, and a bronze socketed point of the Kulai type) suggests a date within the interval between the last third of the 1st millennium BC and the turn of the Christian era.

Dendrochronological analysis

The present study addresses the Bystrovka-2 group consisting of ten mounds. One of the features of its burial rite was the presence of various wooden constructions in the graves. They include frames made of logs and blocks, longitudinal and transverse covers, and massive coffins (Fig. 4). The relatively good preservation of wood (Fig. 5) has made it possible to collect a series of samples for the analysis. A total of 146 fragments from 56 burials were collected and studied. Because the common pine (*Pinus silvestris* L.) is the most suitable arboreal taxon for dendrochronological analysis, only its remains were selected. Indeed, most burial constructions at Bystrovka-2 are made of pine. Some are made of birch (*Betula* sp.), but these were not analyzed.

This is the first time that the dendrochronological method has been applied to the Early Iron Age materials from the Upper Ob In our previous studies (Slusarenko, Borodovsky, 1996: 56 – 61), while attempting to use this method with respect to samples of wood from Bystrovka-2, we were confronted with the following difficulties.

1. Most samples are heavily deformed by the pressure of the ground. The resulting distortion of the original width of the annual rings made it difficult to measure and compare the samples from the various burials.

2. The fragmentary nature of the remains (some samples contain as few as 15 – 20 annual rings, and in half the samples less than 50 rings were preserved) hampered cross-dating and, in some instances, rendered it impossible.

3. In nearly all samples, the external annual rings (the last ones to have formed during the life of the tree) were absent, and even the approximate number of lost rings was impossible to assess. This made it impossible to estimate the dates within one year. The last ring was present in sixteen samples only.

For these reasons, our conclusions concerning the cross-dating of tree-ring series and the relative chronology of various burials and mounds should be regarded as tentative.

After the re-examination of the most suitable samples of wood, only 109 fragments from 40 burials in seven mounds of Bystrovka-2 were used for chronological reconstructions. Mounds 1 and 6 are not represented due to the lack of samples, and mound 2 was excluded because three out of four samples contain no more than twenty annual rings. The number of samples from other mounds is as follows: mound 3: fifteen samples from six burials; mound 4: thirty-four samples from sixteen burials; mound 5: nine samples from seven burials; mound 7: two samples from one burial; mound 8: six samples from one burial; mound 9, thirteen samples from four burials; and mound 10: thirty samples from five burials

Measurements of ring width in samples from the same burial were averaged in order to obtain the generalized sequence of annual rings. The same approach was used to compare the burials and to construct the dendrochronological scheme for separate mounds. By means of cross-dating, the relative, or "floating", generalized dendroscale was constructed for the entire burial ground of Bystrovka-2 (seven out of ten mounds), making it possible to reconstruct the order in which

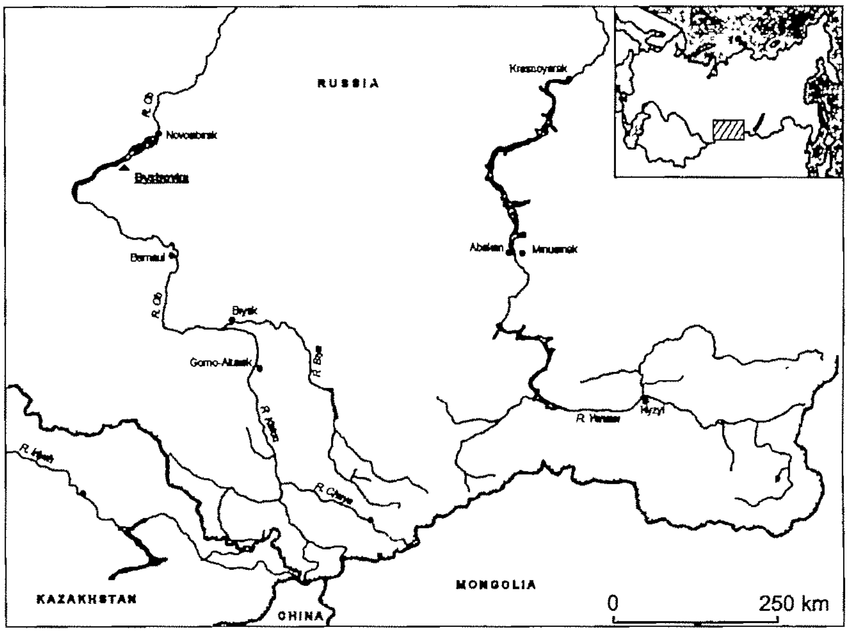


Fig 1 Geographical location of Bystrovka

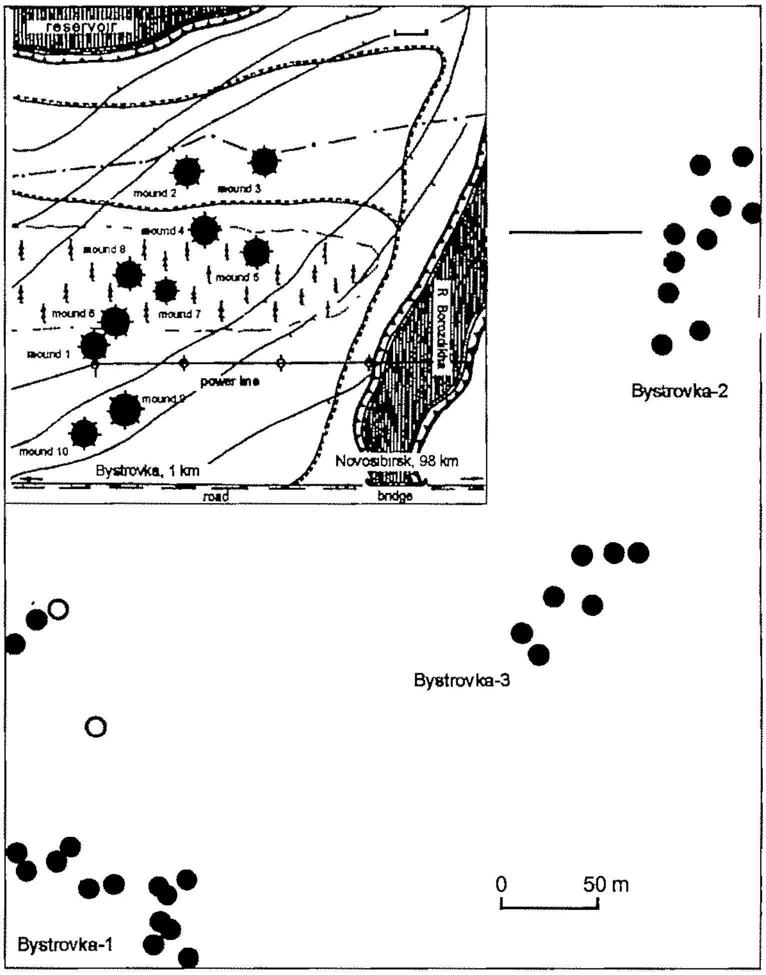


Fig 2. Plan of Bystrovka-2 and other burial grounds at Bystrovka.

Fig 3 Mound 4 in the course of excavations.

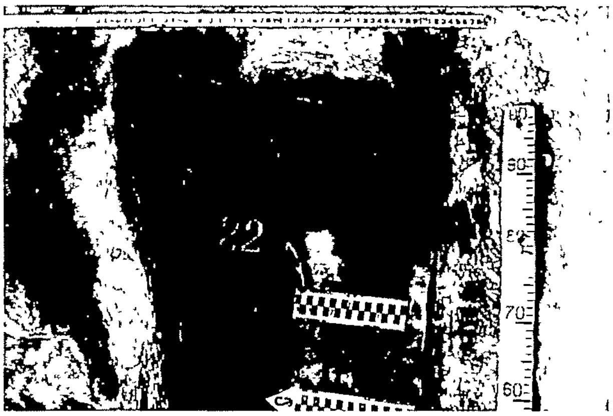


Fig. 5. Fragments of a coffin and a frame made of wooden blocks Mound 10, burial 22.

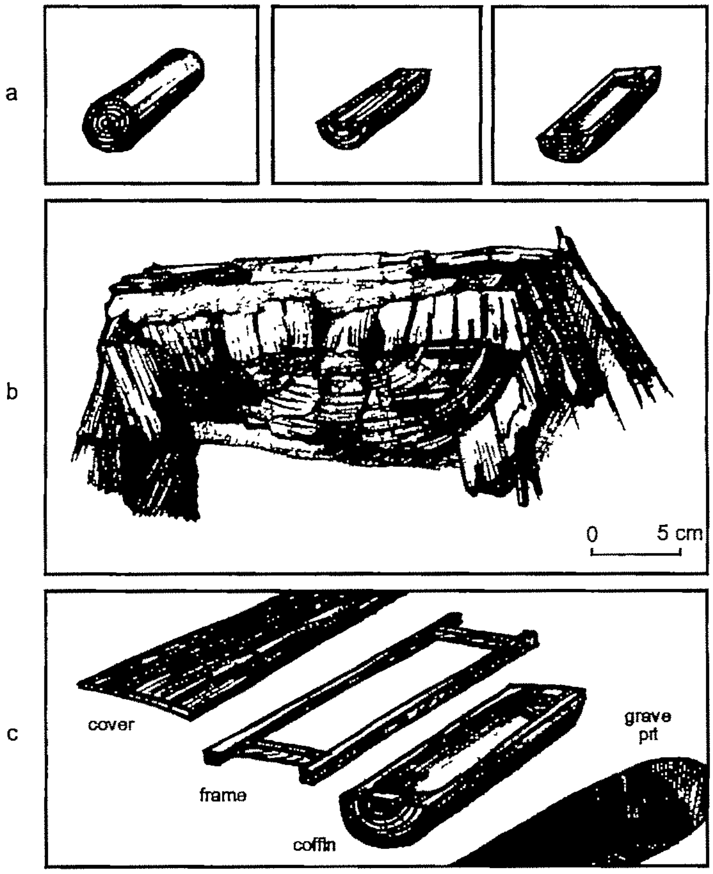


Fig. 4. Types of wooden burial constructions in the graves of Bystrovka-2.
a – variant of making a coffin from the bottom part of a log, *b* – edge of the coffin and of the wooden frame from a child's burial 28 in mound 3; *c* – wooden constructions.

the mounds had been constructed. The concordance of variation in the radial increments across the samples and across the averaged series of rings was assessed using the sign test, synchronicity quotient, correlation analysis, and t-test (Francuz et al., 1985: 210 – 211).

Although our dendrochronological estimates are quite approximate, we considered it useful to carry out this analysis, given that the opportunity is unique for the Upper Ob region. We have proceeded from the assumption that burials within one mound are

Table 1. Results of radiocarbon dating of sample 18955 (Bystrovka-2, mound 3, burial 25, coffin, annual tree-rings)

Sample number	Number of tree-rings from the center	^{14}C date, BP	Number AA-	$\delta^{13}C$, ‰
1	1 – 10	2435 ± 41	37808	– 27.2
2	11 – 20	2410 ± 25	37809	– 26.6
3	21 – 30	2515 ± 30	37810	– 26.7
4	31 – 40	2440 ± 23	37811	– 26.3
5	41 – 50	2440 ± 27	37812	– 26.1
6	51 – 60	2400 ± 23	37813	– 26.0
7	61 – 70	2405 ± 22	37814	– 26.6
8	71 – 80	2355 ± 23	37815	– 26.4
9	81 – 90	2370 ± 23	37816	– 26.9
10	91 – 100	2330 ± 49	37817	– 26.4
11	101 – 110	2270 ± 22	37818	– 26.3
12	110 – 120	2245 ± 23	37819	– 26.2
13	121 – 130	2255 ± 28	37820	– 26.3
14	131 – 140	2245 ± 49	37821	– 26.0
15	141 – 150	2195 ± 24	37822	– 25.8
16	151 – 160	2200 ± 22	37823	– 25.9

broadly contemporaneous, and that the nature of deformation of the samples in adjacent burials is similar, making it possible to compare them.

Radiocarbon dates and their calibration

To connect the "floating" dendroscale with the calendar time scale, high-precision radiocarbon dating of the sample series taken from the same tree log was performed (Table 1). After that, the *"wiggle-matching"* approach was used. Also, radiocarbon dating was conducted on organic matter from the graves such as bone, wood, and charcoal (Borodovsky, Orlova, 2001) (Table 2).

For the high-precision radiocarbon dating, the sample with the maximum number of tree-rings and the least deformation was chosen, in order to obtain the standard for tree-ring synchronization with other samples of wood. This was sample 18955, containing 198 tree-rings, from the burial bed in burial 25 of mound 3 (Fig. 6). For dating purposes, it was subdivided into decadal sub-samples (containing ten rings each), starting from the center toward periphery. The total number of sub-samples was sixteen (160 tree-rings out of 198).

Certain details of radiocarbon dating techniques must be discussed, given that some archaeologists are not yet closely familiar with them. The final outcome of the dating process (Arslanov, 1987; Orlova, 1995a) is the date expressed in *radiocarbon years before present (YR BP)*. Laboratories normally report dates with standard deviations (±1 s.d.).

The length of one radiocarbon year is not well defined. When two radiocarbon dates are being compared, this determination is not important. However, when archaeologists operate with time scales such as *Before Christ* (*BC*) and *Anno Domini* (*AD*), methodological mistakes may have an appreciable effect. Radiocarbon years are converted to calendar years (i.e., *astronomical* ones, where a year equals ca 365.25 days), by simply subtracting 1950 years from the radiocarbon value (or vice versa, if the radiocarbon date is less than 1950 years) (see (Kuzmin, 1993)).

In archaeology, the Christian calendar time scale beginning with the birth of Jesus Christ is widely used, especially for the recent periods. To obtain dates corresponding to this time scale, calculation of the calendar age is necessary. This procedure is called *calibration*. Calibrated dates are expressed in *calendar years BC* or *calendar years AD* (from 1950 AD), and in *calendar years before present (cal BP)*. To obtain the calendar age in *calendar years BC*, it is necessary to subtract 1949 years from the value expressed in *calendar years BP* (because the year Zero does not exist in the Christian calendar).

Libby (1955), who invented the radiocarbon dating method in the late 1940s, assumed that the content of the ^{14}C isotope in the atmosphere was constant throughout several millennia (Fig. 7, A, *2*). Subsequently, high-precision radiocarbon dating (having an error of ±20 – 30 years) of long tree-ring sequences with a known calendar age showed that a systematic difference exists between radiocarbon and

Table 2 Radiocarbon dates from Bystrovka

N	Sample location (mound, burial)	^{14}C date, BP	Laboratory code	Calibrated date (±2σ), years BC	Material dated
		Bystrovka-2			
1	Mound 2, burial 8	2445 ± 45	SOAN-3924	780 – 400	Bone
2	burial 11	2380 ± 45	SOAN-3926	760 – 390	»
3	burial 13	2560 ± 40	SOAN -3925	810 – 540	»
4	Mound 3, burial 11	2355 ± 60	SOAN-3957	760 – 230	»
5	burial 18a	2440 ± 45	SOAN -3929	780 – 400	»
6	burial 18b	2510 ± 40	SOAN-3927	800 – 410	»
7	burial 21	2280 ± 50	SOAN-3928	410 – 200	»
8	Mound 4, burial 5a	2250 ± 80	LE-5432	410 – 90	Wood
9	burial 5b	2150 ± 25	LE-5431	350 – 110	»
10	burial 27a	2290 ± 65	SOAN-3958	480 – 180	Bone
11	burial 27b	2210 ± 45	SOAN -3959	390 – 120	»
12	burial 29	2280 ± 40	SOAN-3960	400 – 210	»
13	burial 35	2240 ± 30	LE-5434	390 – 200	Wood
14	Mound 5, burial 13	2320 ± 40	SOAN-3961	410 – 240	Bone
15	burial 30	2250 ± 80	SOAN -3962	410 – 90	»
16	burial 32	2140 ± 60	LE-5433	378 – 1	Wood
17	Mound 6, burial 4	2155 ± 55	SOAN-3971	380 – 10	Bone
18	burial 12a	2210 ± 40	SOAN -3964	390 – 170	»
19	Mound 7, burial 4	2340 ± 35	SOAN-3965	480 – 270	»
20	burial 5	2245 ± 55	SOAN -3973	400 – 170	»
21	burial 7	2800 ± 110*	SOAN-3739	1290 – 790	Charcoal
22	Mound 9, burial 2	2285 ± 60	SOAN -3966	410 – 180	Bone
23	burial 8	2400 ± 40	SOAN-3967	760 – 390	»
24	Mound 10, burial 10	2200 ± 60	SOAN -3968	400 – 60	»
25	burial 13	2400 ± 90	SOAN-3969	790 – 210	»
26	burial 15	2380 ± 45	SOAN -3970	760 – 390	»
		Bystrovka-1			
27	Mound 17 (B), burial 1	2390 ± 75	SOAN-3956	780 – 260	»
		Bystrovka-3			
28	Mound 6, burial 4	2345 ± 65	SOAN-3972	760 – 210	»
29	burial 8	2410 ± 75	SOAN-3963	790 – 260	»

* This date is probably erroneous and is not taken into consideration

calendar dates. This conclusion was first stated by de Vries in the late 1950s (Vries, 1958); (see (Plicht, 1998) for a review) It became evident that significant fluctuations of ^{14}C content in the atmosphere during the Holocene caused either "compression" or "stretching" of the calendar time scale compared with the radiocarbon scale (Fig. 7, A, *1*). It was necessary to assess the extent of these deviations and to create tables for the calculation of calendar ages. For this purpose, the dating of wood samples from continuous dendroscales with a step of 10 – 20 years was performed. As a result of long-term studies, the deviations of radiocarbon dates from the true (calendar) dates were measured (Suess, 1967; Klein J et al., 1982; Pearson, Stuiver, 1986; Stuiver, Pearson, 1986; Pearson et al., 1986; Pearson, Becker, Qua, 1993; Kromer, Becker, 1993). The relationship is quite complicated, and there are several places on the calibration curve where ^{14}C age "freezes," whereas the calendar age decreases (Fig. 7, A, B).

In 1986, the first special issue of the journal *Radiocarbon*, devoted to the calibration of the radiocarbon time scale, was published (1986 Calibration Issue, 1986). In 1993, the new edition became available (Calibration..., 1993), and in 1998 the third calibration issue appeared (INTCAL-98..., 1998). Computer software for radiocarbon date calibration has been developed (Plicht, 1993; Plicht, Moor, Hasper, 1990; Stuiver, Reimer, 1993; Ramsey, 1995; Stuiver et al., 1998). More details about calibration can be found in the reference sources (Taylor, 1987. 133 – 142; Pearson, 1987; Arslanov, 1987: 88 – 105, Aitken, 1990: 92 – 108; Dergachev, Veksler, 1991: 126 – 131).

At present, in order to perform the radiocarbon date calibration, it is necessary to have an uncalibrated date, set the half-life of the ^{14}C isotope at 5568 years, and select AD 1950 as the reference point. We used the CALIB 4.3 program (Stuiver, Reimer, 1993; Stuiver et al., 1998); calendar dates were calculated with maximal confidence limits (within $\pm 2\sigma$), and all possible calendar intervals were combined.

The connection of "floating" dendroscales using "wiggle-matching" approach

Until the mid-1980s, specialists working with dendroscales which were not matched with the modern ones (so-called "floating" dendroscales) were unable to connect them with the calendar time scale. Only after the radiocarbon calibration graphs and tables for the last 10,000 years had been published, it became possible to date the "floating" dendroscales with a high degree of accuracy (within 20 – 30 years). This method is known as "wiggle-matching" (Taylor, 1997: 71), a term stemming from "wiggles" on the calibration curve (Fig. 7, A, B)

The "wiggle-matching" procedure is derived directly from the radiocarbon date calibration (Aitken, 1990: 103 – 105; Taylor, 1997: 76 – 78). Its principal idea is to match series of consecutive radiocarbon dates, obtained from the "floating" dendroscale, with the reference curve showing the fluctuations of the radiocarbon content in the atmosphere, obtained from dating long tree-ring sequences (Fig. 7, B, C). Having enough samples in the "floating" series (no less than five to ten), it is possible to find the common peaks of radiocarbon content in both series, and thus to connect the "floating" dendroscale with the calendar time scale with at least 95% accuracy (Pearson, 1987; Aitken, 1990). In some cases, it is possible to connect even very short "floating" series, consisting of only four to five dates (Kojo et al., 1994).

Since the early 1990s, Bayesian statistics have been applied for calibrating radiocarbon date series reflecting sequences of events or different phases of evolution of an archaeological culture (Buck et al., 1991; Buck, Cavanagh, Litton, 1996: 232 – 245; Litton, Buck, 1995; Christen, Litton, 1995) The

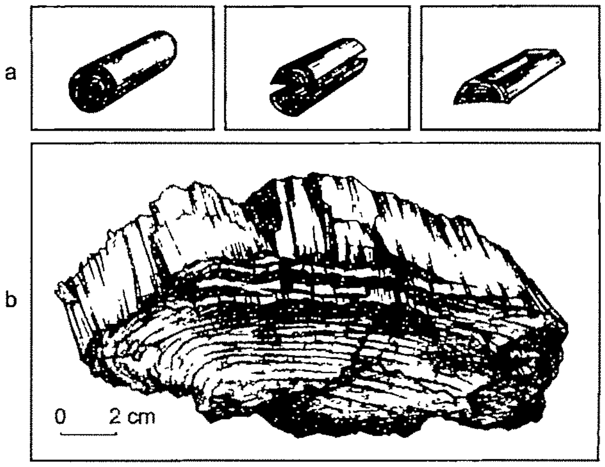


Fig 6 Sample of wood for radiocarbon dating (coffin from mound 3, burial 25).
a – scheme showing the process of making a coffin,
b – short side of the coffin, used for dating

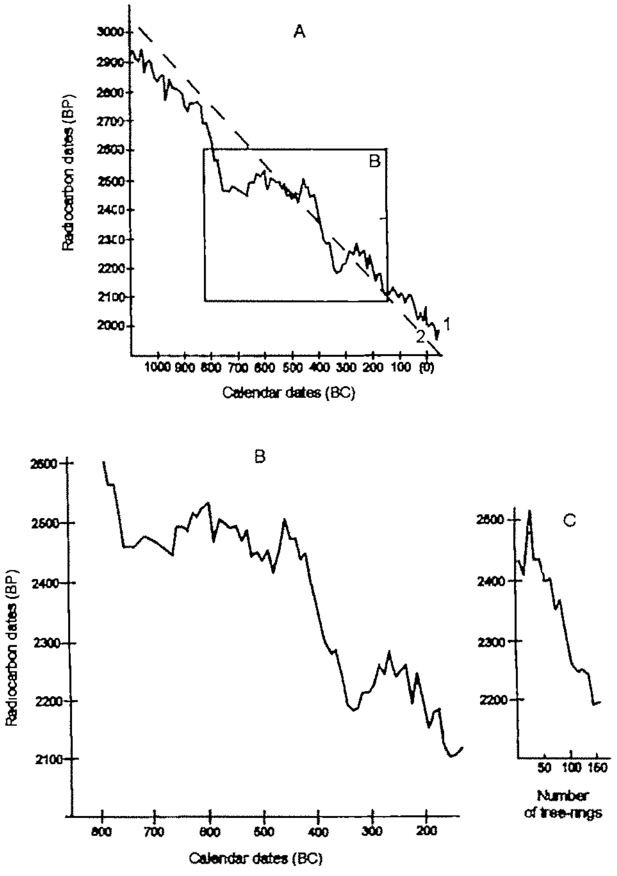
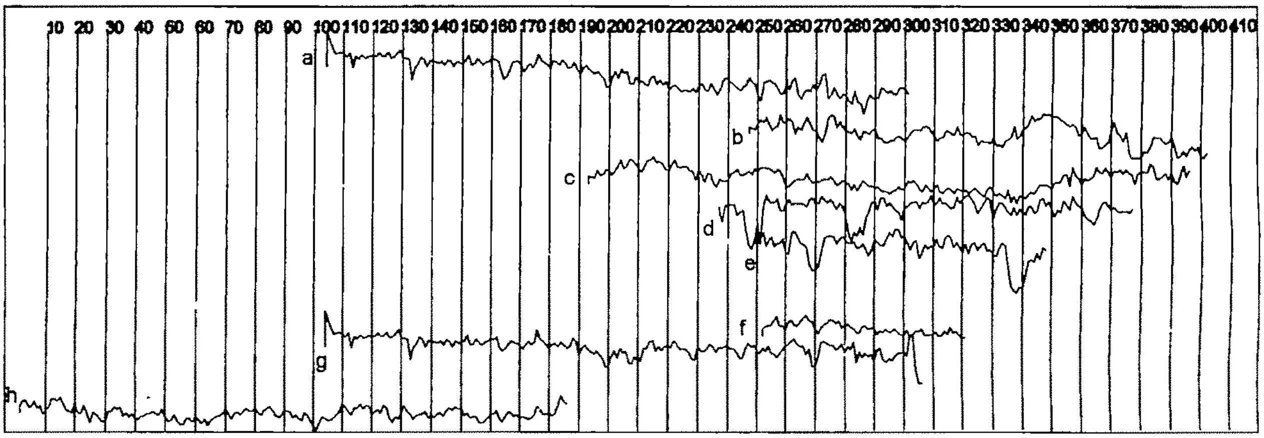


Fig 7. Fragment of the INTCAL-98 calibration curve (A). *1* – curve of correlation between calendar and radiocarb on dates; *2* – linear relationship between calendar and radiocarbon dates; (B) the enlarged part concerns the period of 2100 – 2600 BP, and (C) the curve of radiocarbon age estimates within the "floating" dendroscale based on sample 18955



Chronological range of annual tree-rings

Fig 8 Synchronization of tree-ring growth curves for Bystrovka-2.
a – sample 18995, *b* – mound 9, *c* – mound 10, *d* – mound 5, *e* – mound 8, *f* – mound 7, *g* – mound 3, *h* – mound 4

important requirement for the application of Bayesian statistics to "wiggle-matching" is the knowledge of the chronological sequence of the samples. In our case we have radiocarbon-dated tree-ring series, and the time intervals between them are exactly known. Prior to this study, we used Bayesian statistics for the "wiggle-matching" of dates from the Ulandryk-4 burial ground using the "floating" dendroscale (Slusarenko et al., 2001).

Contrary to a simple mechanical connection of radiocarbon date series with the reference curve (Kojo et al., 1994) or computerized connection (Plicht, 1993, Stuiver, Reimer, 1993; Ramsey, 1995), the Bayesian approach allows one to carry out the remodeling of the calibration curve and to calculate the posterior probability density of calibrated dates in the experimental series with a probability of no less than 95% (Christen, 1994; Buck, Cavanagh, Litton, 1996: 238, 242 – 245). At present, the Bayesian approach to calibration and "wiggle-matching" (Christen, Litton, 1995) seems to be one of the most promising methods.

In our case, the *Mexcal* software (available from J.A. Christen on request) was employed, and the high-precision 1998 calibration curve was used (see (INTCAL-98 .., 1998)). As mentioned, samples contain ten tree-rings each. This means that the calendar age of each sample (θ_i) is ten years larger than that of the subsequent sample, i.e. $\theta_{i+1} = \theta_i - 10$ calendar years. Thus, beginning from the last, "external" sample, we have the following sequence. θ_1; $\theta_2 = \theta_1 + 10$; $\theta_3 = \theta_1 + 20$; etc. Knowing θ_1, it is possible to estimate the calendar ages of the remaining samples. Therefore, only the posterior density for θ_1 was calculated. The posterior density represents the probable value of θ_1, i.e., the mean calendar date of the moment when the organic matter in the last sample ceased to exchange carbon with the environment (see (Christen, Litton, 1995) for details).

Results and discussion

As a result of cross-dating samples from various burials arranged according to mounds, generalized dendroscales were constructed for mounds 3, 4, 5, 9, and 10. The number of burials on which the "floating" scales were based ranges from four (mound 9) to sixteen (mound 4). Mounds 7 and 8 were represented by one burial each. Average annual variation curves for separate mounds were matched with a view of constructing the relative chronological scale for the entire Bystrovka-2 burial ground. The number of annual rings on which the scales were constructed is as follows: mound 3, 203; mound 4, 186; mound 5, 141; mound 7, 70; mound 8, 98; mound 9, 156; mound 10, 204.

Based on cross-dating, the chronological succession of mounds is as follows: mound 4 (the earliest one) – mound 3 – mound 5 – mounds 9 and 10, which are the latest and contain virtually synchronous burials (Fig. 8). Because the period of overlap of the dendroscale for mound 4 with that of the entire burial ground (83 years) is minimal, our conclusion that this mound is the earliest one must be viewed as tentative.

On the basis of sixteen radiocarbon dates obtained from sample 18955 (see Table 1), the dendroscale was connected with the calendar time scale using

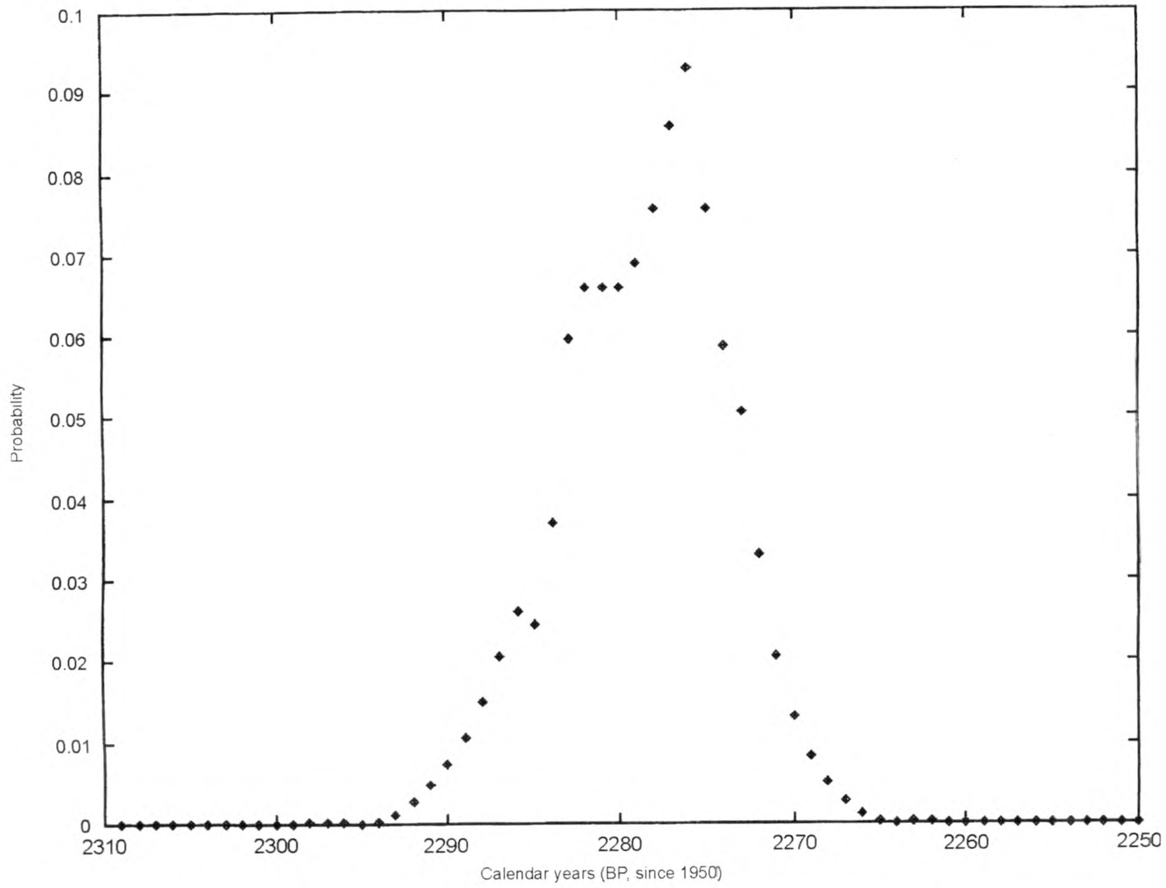


Fig. 9. Posterior probability density of calibrated dates for sample 18995.

the "wiggle-matching" approach. The posterior probability distribution for θ_1 is shown in Fig. 9. It shows a distinct peak corresponding to 2276 calendar years BP (from AD 1950), or 327 BC, on the calendar scale. The probability that θ_1 coincides with this year is 9.2%. Overall, with a 97% probability, θ_1 falls within the range 2290 – 2270 calendar years BP. The probability that it falls within 2284 – 2273 calendar years BP is 80%. Notably, the distribution curve of the posterior density is asymmetrical, as is the calibration curve.

Having accepted 2276 calendar years as the best fit, we have matched the radiocarbon date series (with standard deviations) with the calibration curve so that the youngest date coincides with this estimate (Fig. 10). The background is provided by a fragment of the calibration curve for the 2250 – 2450 years interval with the respective standard deviations (see (Christen, Litton, 1995) for details). All radiocarbon dates, except 2515 ± 30 years BP (AA-37810), fall within twice the standard deviation from the calibration curve. In our view, this attests to a very good fit (within 12 years), given that the wood is ca 2400 years old. For several reasons, though, caution needs to apply. First, the number of rings in each sample is only ten. Second, the standard deviation of the calibration curve in the 2500 – 2000 interval equals 10 – 44 years (21 years on average, based on 50 measurements in the 495 – 5 BC interval) (Stuiver, Becker, 1993: 59). Third, the error inherent in measuring groups of rings equals 22 – 49 years (see Table 1). However, at present, the "wiggle-matching" method is the most reliable technique of matching dendroscales with the calendar scale.

Having estimated the end of the "connected" dendroscale (ring nos.150 – 160) at 327 BC, we must subtract 38 years from this date to assess the date of the last available ring, since the number of rings in the sample is 198. We thus arrive at 289 BC as the date when the last available ring in the wood from burial 25 of mound 3 was formed. On the assumption that no more than 10 – 20 external rings have been lost (given the age of the wood and the external features of the sample), it may be expected that the estimated date is close to the real date of this burial.

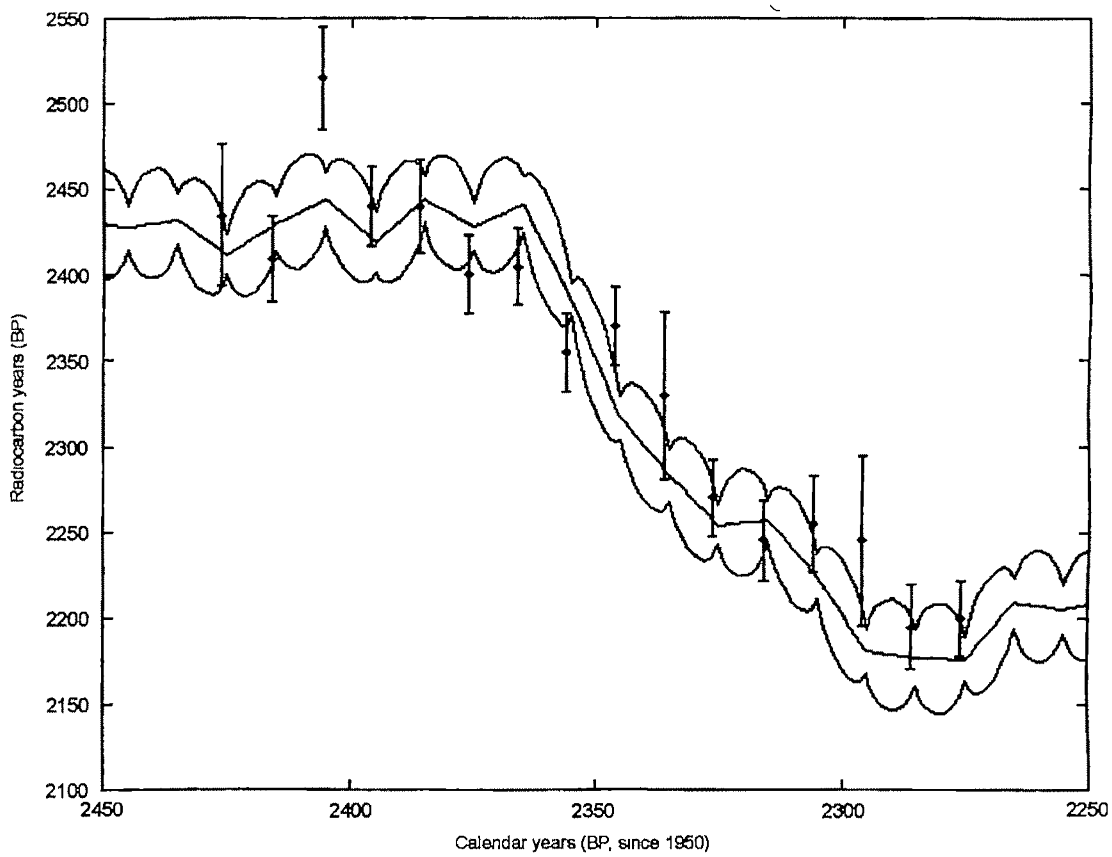


Fig. 10. Radiocarbon date series obtained for sample 18995 and calibration curve (solid line).

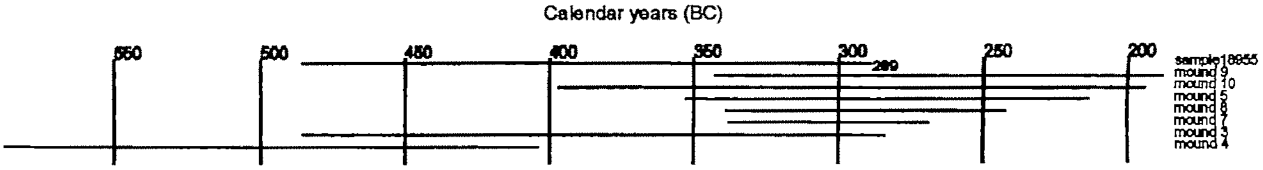


Fig. 11. Calendar intervals of defndroscales for mounds at Bystrovka-2.

Based on the estimated calendar date of this burial and the chronological order of mounds derived from the generalized dendroscale, we can reconstruct the chronology of Bystrovka-2 (Fig. 11, Table 3). It should be noted that the period during which the burials in a specific mound were constructed does not fully correspond to the length of the dendroscale for this mound, since this scale includes all the preceding years during which the annual rings formed in the trees of which the burial constructions are made.

The calendar estimates for separate burials arranged according to mounds are tentative. This is due to the poor preservation of wooden constructions (several external rings are nearly always absent). Also, some rings, both external and internal, were lost during the preparation of blocks for the frames, which occurred quite frequently at Bystrovka.

In nearly all samples, therefore, the last annual rings were lacking, precluding the assessment of the dates when the trees were felled. Because the exact number of lost rings was often impossible to determine, the date of the last preserved ring was used as *terminus post quem*, the year after which the tree had been felled (Chernykh, 1996: 57). Accordingly, calendar intervals during which the

Table 3. Dendroscales and absolute chronology for mounds of Bystrovka-2

Sample location	Length of dendroscale, years	Calendar interval of dendroscale, years BC	Time of the burials' construction, years BC
Sample 18955	198	486 – 289	Ca 280
Mound 3	203	486 – 284	330 – 280
Mound 4	186	589 – 404	500 – 400
Mound 5	141	353 – 213	290 – 210
Mound 7 (burial 6)	70	338 – 269	Ca 250
Mound 8 (burial 6)	98	339 – 242	Ca 240
Mound 9	156	343 – 188	230 – 180
Mound 10	204	397 – 194	240 – 190

mounds had been constructed were estimated as intervals between the *post quem* dates of the earliest and the latest burial in the mound. Based on this criterion, most mounds at Bystrovka-2 were constructed between the early 5th and the early 2nd centuries BC (it should be remembered that our conclusion concerning mound 4 as the earliest one is tentative).

To assess the chronology of the entire Bystrovka-2 burial ground, we used radiocarbon dates based on samples of wood and bone (see Table 2). After their calibration it was found that the earliest one is burial 13 of mound 2 (810 – 540 BC), and the latest one is burial 32 in mound 5 (378 – 1 BC). Other estimates are as follows. mound 2, 810 – 390 BC; mound 3, 800 – 200 BC; mound 4, 480 – 90 BC; mound 5, 410 – 1 BC; mound 6, 390 – 10 BC; mound 7, 480 – 170 BC; mound 9, 760 – 180 BC; mound 10, 790 – 60 BC. Based on radiocarbon dates, the chronological order in which the mounds were constructed is the following: mound 2 – mounds 3, 9, and 10 – mounds 4, 5, 7, and 6.

The calendar intervals for Bystrovka-1 and Bystrovka-3 burial grounds generally fall within the interval for Bystrovka-2 (see Table 2). However, because there are only three dates for these cemeteries, it is impossible to specify this conclusion

The correlation between the calendar years based on dendroscales and radiocarbon dates of burials in Bystrovka-2 is supported by traditional archaeological criteria such as stratigraphy. Specifically, certain burials are arranged in stratigraphic sequences. In mound 4, burial 5a with a date of 490 BC (based on the dendroscale) overlies burial 5b, dated to 493 BC. Radiocarbon analysis of samples of wood from these burials have yielded calendar intervals of 350 – 110 BC and 410 – 90 BC, respectively.

The agreement between the dates based on various science-based methods is observed for certain other burials as well. Thus, burial 27b in mound 4 is dated to 404 BC according to the dendroscale, and to 390 – 120 BC according to the radiocarbon analysis of human bones; the respective dates for burial 13 in mound 5 are 253 BC and 410 – 240 BC, and those for burial 32 in the same mound, 263 BC and 378 – 1 BC.

According to another traditional archaeological criterion (Worsaae's law), the assemblage is dated according to the latest artifact it contains (Klein L.S., 1980). Hence, problems may arise regarding the choice of the most reliable of several chronological intervals that sometimes result from calibration (Plicht, 1993). In our view, the choice should be made on the basis of the dendroscale connected with the calendar scale.

The correlation between the chronological sequence of mounds based on the dendroscale and on radiocarbon dating suggests that the agreement between both methods is satisfactory. Thus, both approaches suggest that certain burials in mounds 3 and 5 and those in mounds 10 and 9 at Bystrovka-2 are contemporaneous. Lack of agreement is observed only for mound 4, which is the earliest one according to the dendroscale (Fig. 11), but is among the late ones based on the radiocarbon analysis of human bones (see Table 2). This does not challenge our previous conclusions Rather, the reasons of the discrepancy must be examined in more detail, a task to be addressed in a separate publication.

The application of radiocarbon and tree-ring dating to the materials from Bystrovka provides a possibility for a revision of the chronology of this burial ground and of the Berezov stage of the Early Iron Age in the Upper Ob region in general.

This task is all the more important because the second half of the 1st millennium BC is the crucial period in the history of the steppe and forest-steppe zone of Eurasia, including southwestern Siberia. This was the time when certain ethnic cultures had already formed, whereas others were beginning to form.

Complexity of the ethno-cultural pattern renders the dating procedure quite difficult on the basis of archaeological typology. The classic rule of using the latest artifacts for assessing the dates is often inapplicable because of the lack of reliable typological schemes.

Typological parallels are helpful for establishing the period in which the assemblage belongs, but not its exact date. In each case, chronological limits on the existence of certain types must be determined for each territory. In the Upper Ob region, this is especially important because the assemblages are often uninformative or contradictory, which precludes accurate dating. By the late 1990s, many archaeologists admitted that using archaeological parallels for dating is rather unreliable and inconsistent (see, e.g., (Martynov, Sher, 1989: 177)).

Science-based methods of absolute dating used in this study, in contrast, are more objective and reproducible. The combination of dendrochronological and radiocarbon techniques enables us to arrive at a reliable chronology of the most representative mound groups in the Upper Ob region.

Conclusions

Our findings indicate that the last annual tree-ring available in sample 18955 from mound 3, burial 25 of Bystrovka-2 formed in 289 BC. Based on this result and on the chronological order in which the mounds were constructed, their date may be estimated at the early 5th – early 2nd centuries BC.

Results of the calibration of a series of radiocarbon dates based on wood and human bones from Bystrovka 1 – 3, generally agree with those obtained by connecting the dendroscale with the calendar time scale.

Taken together, our data suggest that Bystrovka-2 is earlier than previously thought. A large series of dates (over forty) for this burial ground provides an opportunity to revise the classification of the Early Iron Age in the Upper Ob region on a qualitatively new level. Also, they make it possible to assess the chronology of separate mounds and burials within this site, spanning almost the entire second half of the 1st millennium BC.

No less important is the possibility of an objective evaluation of a long series of radiocarbon estimates for a single burial ground. Rather than speaking of an (often incidental) "agreement" between isolated absolute dates and the traditional periodization, as before, we can now compare these independent sources of information using modern statistical techniques.

Because our data are representative and the results of various analyses are independent, they can be used as a reference point for the revision of the chronology of "dating artifacts" both from Bystrovka and from other actually or allegedly contemporaneous burial grounds in the Upper Ob region.

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CERAMIC COMPLEX OF THE MYLNIKOVO SETTLEMENT IN THE ALTAIAN FOREST–STEPPE OB RIVER REGION DATING TO THE BRONZE–EARLY IRON AGE TRANSITIONAL PERIOD*

Introduction

There are many disputable questions related to the cultural genesis, chronology, and historical destiny of the population which left numerous archaeological sites in the Upper Ob River region dating to the transitional period from the Bronze to Early Iron Age. In the 8th century BC, the cultures of the Altaian forest–steppe Ob River region experienced significant changes due to the internal development, intense migrations, and the formation of Early Scythian cultures in the adjacent territories. As a result, the 6th century BC population of the Altaian forest–steppe was involved with the Scythian cultural community. It is difficult to reconstruct the processes of cultural genesis that took place in this region in the 8th – 6th centuries BC because of their diversity and complexity. In addition, many scholars disregard some types of archaeological sources, for example, new archeological data or results of previous excavations. Some collections have been shelved or reported only briefly, although a great part of these materials was found at sites subjected to intense excavations. The most representative collections were found at the fortified settlements of Elbanka and Zavialovo I and V and at the settlement of Malyi Gonbinskiy Kordon 1/3, etc. In this list, the Mylnikovo settlement is of special interest.

Description of the Mylnikovo settlement

The Mylnikovo settlement is located 7 km north of Barnaul, on the right bank of the Ob River (Fig. 1), on the western outskirts of the former village of Mylnikovo (at present, the Mylnikovo gardening community). It is situated on the bank of the Ob River mainstream, to be more exact, on the terrace sloping to the Mylnikovo branch (formerly a riverbed of the Ob). Mylnikovo is a unique settlement as it was never dwelled upon before or after the Bronze to Early Iron Age transitional period; therefore, this complex is a reference site of the Bolsherechenskaya Culture of the transitional period. Unfortunately, the Russian village of Mylnikovo was built on this site and the gardening community contributed greatly to the destruction of its cultural layer

The Mylnikovo settlement was discovered by history teacher A.D. Sergeev* in 1954. He started excavations on an area of 18 sq. m. The settlement

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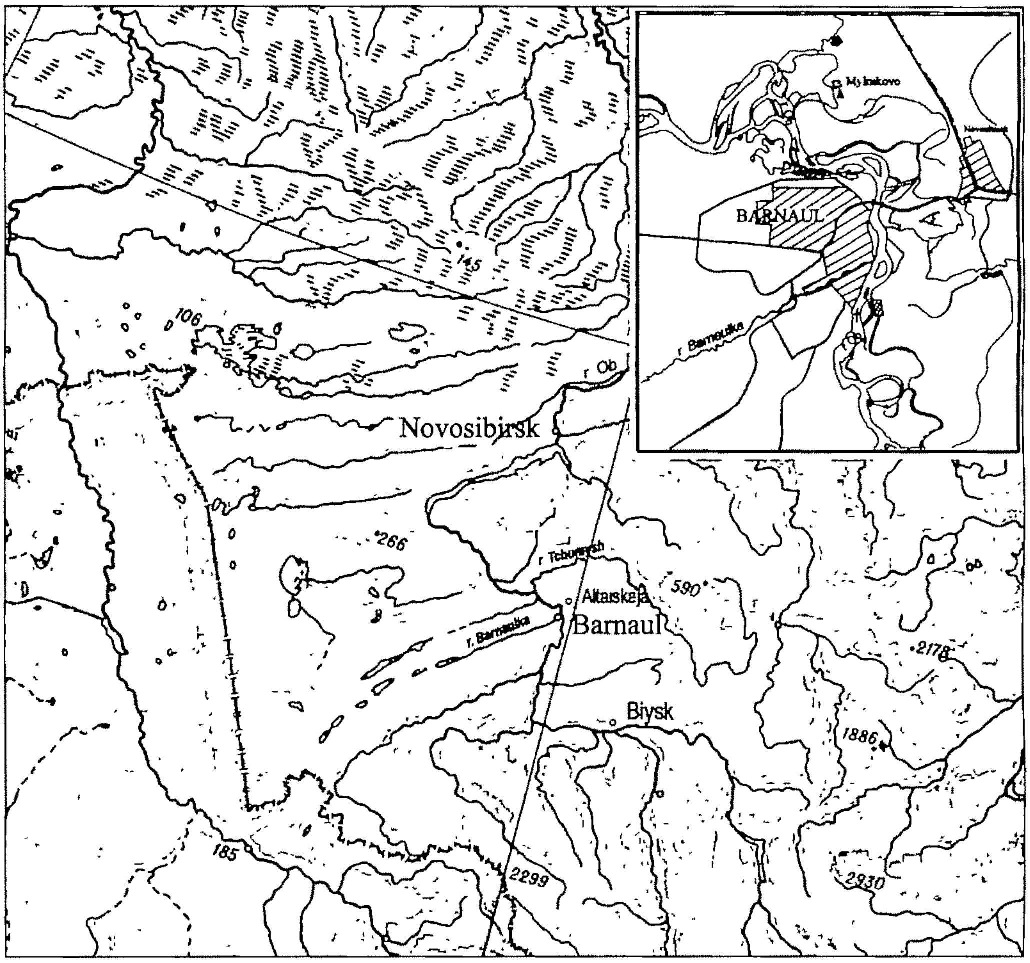


Fig 1 Map showing the location of the Mylnikovo settlement.

was mentioned by Griaznov among the sites of the Bolsherechensk stage of the Bolsherechenskaya Culture (1956: 69). From 1983 – 1987, Shamshin conducted annual rescue excavations at this site because its territory was allotted to a gardening community, whose activity could have destroyed the entire cultural layer. Rescue excavations conducted in three excavation areas covered an area of more than 866 sq. m., i.e., the preserved part of the settlement (Shamshin, 1985: 250; 1986a: 207; 1986b: 100 – 101; 1987a: 39 – 40; 1987b: 294; 1988a, b; 1989; Abdulganeev et al., 1988: 206; Kiryushin, Shamshin, 1987: 156, fig. 10, *1 – 4*; Matveev, 1986: 61, fig. 1 – 66; Mzhelskaya, 2002a, b; Papin, Shamshin, 1998). Unfortunately, a great part of the unique collection from this site has not yet been published.

Cultural attribution

The materials of the Mylnikovo site have been given different cultural and chronological attributions. In his report, Sergeev, the discoverer of the site, gave no cultural or chronological references. Griaznov dated the settlement to the 7th – 6th centuries BC and attributed it to the Bolsherechensk stage of the Bolsherechenskaya Culture, which was well studied by the materials from the Blizhnie Elbany site (BE I, VII, XII, and XIV) (1956: 69). Matveev assigned the Mylnikovo settlement to the Late Irmen stage of the Irmen Culture (1986: 64).

Shamshin reviewed the Mylnikovo archaeological collection taking into account new results of the 1980s excavations. At first, he distinguished the Mylnikovo complex as a special stage of the Final Bronze Age and dated it to the second half of the 8th – 7th centuries BC. He proposed that the Mylnikovo settlement still existed at the Bolsherechensk stage of the Bolsherechenskaya Culture in the Upper Ob River basin (1986b: 102). Later, Shamshin supported a hypothesis by Mogilnikov, who distinguished the Bolsherechensk stage as an independent culture of the transitional period. As Shamshin believes, the Bolsherechenskaya Culture included the early (Mylnikovo) stage dating to the second half of the 8th – 7th centuries BC and the late (Blizhnie Elbany) stage dating to the 7th – 6th centuries BC (1988c: 113 – 114; 1989: 119, 121). Shamshin presented a detailed analysis of the culture, determined its chronology, including internal classification, and outlined its place among the simultaneous cultures of the transitional period (Shamshin, 1988a, b; 1989).

Papin and Shamshin (1998) characterized the culture and chronology of the sites of the transitional period, analyzed available artifacts, reconstructed economic activities of the Mylnikovo population, and published the Mylnikovo ceramic complex in detail. Mzhelskaya examined the ceramic collection from the Mylnikovo settlement, distinguished decorative and morphological types of the ceramics, and compared the collection from this site with that from the Zavialovo fortified settlement located in the Ob River basin in the Novosibirsk Province (2002a, b). Thus, there are several papers focused on studying the Mylnikovo archaeological collection However, a detailed analysis of the Mylnikovo ceramics focused mainly on its technological aspect is still lacking.

Diagnostic artifacts

The Mylnikovo settlement yielded the following collection of diagnostic objects.

Two-blade leaf-shaped shaft bronze arrowhead (Fig. 2, *8*). Analyzing Tagar two-blade shaft arrowheads, Kulemzin determined that leaf-shaped specimens are similar to the 4th – 3rd century BC triangular arrowheads with prominent shoulders (1976: 43 – 56), which were brought to Siberia from Central Asia where they appeared in the late 2nd millennium BC (Ibid.: 49, 52). According to the Chlenova's classification, two-blade leaf-shaped arrowheads can be of the bush type only (in contrast to shaft arrowheads); in this group, some specimens that are morphologically close to the Mylnikovo arrowhead but larger in size are classified as Pre-Tagar arrowheads (1967: plate 12, 7). Chlenova dates them to the 7th or 7th/early 6th centuries BC (Ibid.: 41). Arrowheads analogous to Mylnikovo specimens were found at the Aishrak burial site (Margulan et al., 1966: plate I; VI, *2*; Margulan, 1979: fig. 227, *12*) and the 10th – 8th century BC settlement of Shortandy-Bulak of the Begazy-Dandybai Culture (Margulan, 1979: fig. 161, *8*; 227, *11*) in Central Kazakhstan. Ivanov (1995) has dated two-blade leaf-shaped shaft arrowheads to the late Bronze Age (13th/12th – 8th centuries BC) Thus, for the forest-steppe Altai, the arrowheads of this type must be dated to the 8th century BC.

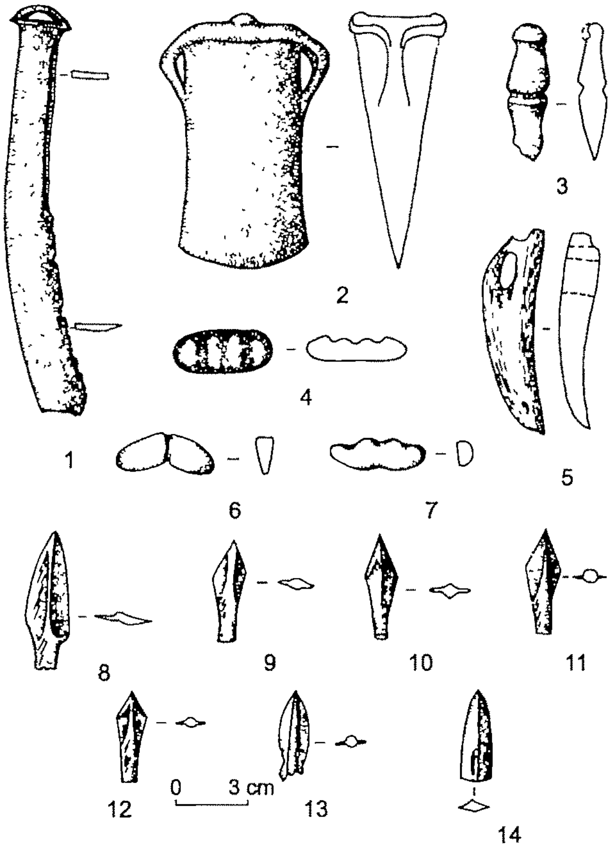


Fig 2 Diagnostic artifacts from Mylnikovo.
1, 2, 8 – 14 – bronze, *3* – stone, *4 – 7* – bone

Two-blade asymmetrically and symmetrically rhomboid bush bronze arrowheads (4 items) The arrowheads have a cylindrical bush and blades reaching the lower edge of the bush (Fig. 2, *9 – 12*). These arrowheads have a wide range of analogues from various territories. The most ancient Siberian specimens of this type were found at the Arzhan burial (Griaznov, 1980: fig. 12, *8*). Chlenova (1967: 46), as well as Kulemzin (1976: 52), dated this type for the Tagar Culture to the 7th – 6th centuries BC. In the Volga River basin, symmetrically rhomboid arrowheads were in use during the 7th – 5th centuries BC, whereas asymmetrically rhomboid analogues were spread in the 7th – 6th centuries BC (Smirnov, 1961: 110, fig. 11, Б4, E9). In West Siberia, these arrowheads were typical of the following cultures dating to the Bronze to Iron Age transitional period: Zavialovskaya Culture – Zavialovo V settlement (Troitskaya, Zakh, Sidorov, 1989: 103 – 116, fig. 1, *14*, *15*), Krasnoozerskaya Culture – Novotroitsk-1 (Trufanov, 1994: 57 – 77, fig. 7, *9*) and Inberen VI settlements (Chlenova, 1994: fig. 8, *9*), Bolsherechenskaya Culture – Blizhnie Elbany VII burial site (Griaznov, 1956: plate XVIII, *4*), and in the Early Scythian complexes of Gorny Altai (Kiryushin, Tishkin, 1997: 82, fig. 52, *6*, *8*, *10*; 60, *8 – 10*, *14*). Ivanov believes that in Siberia, arrowheads of this type were common in the second half of the 8th – 7th centuries BC. For the Altai region, however, this date, taking into account the date of Borovoe III (Abdulganeev, 1993: 55, fig. 3), shifts to the second half of the 8th – 7th centuries BC (Ivanov, 1993: 57).

Two-blade leaf-shaped arrowheads with prominent bushes (2 items; Fig. 2, *13*). These arrowheads have numerous analogues. For the Volga River basin, Smirnov dates these arrowheads to the 6th – early 5th centuries BC (1961: 38 – 44). Kulemzin attributes analogous specimens from Tagar complexes to the 6th – 4th centuries BC (1976: 45). Finds of analogous arrowheads have also been reported from the Begazy-Dandybai Culture (Margulan, 1979: fig. 227, *10*, *14*, *17*), the Late Bronze cultures of ceramics with rollers dating to the 9th – 8th centuries BC (Arslanova, 1983: 124, fig. 1, *11*, *13*, *15*, *16*, *38*), and the Early Scythian complexes in Gorny Altai (Kiryushin, Tishkin, 1997: 82, fig. 58, *9*; 59, *13*; 60, *13*). They were found among artifacts of cultures belonging to the Bronze to Early Iron Age transitional period: Zavialovskaya Culture (Linevo-1 settlement) (Troitskaya, Zakh, Sidorov, 1989: 104, fig. 1, *27*) and Krasnoozerskaya Culture (Inberen VI settlement) (Chlenova, 1994: figs. 8; 9, *3*). Ivanov dates the arrowheads of this type found in the forest-steppe Altai region to the 8th – 6th centuries BC (1993: 57).

Laurel-shaped bronze arrowhead with a rhomboid cross section and a cut bush (1 item). This arrowhead was found in a set of 45 bone arrowheads (Fig. 2, *14*). An analogous arrowhead was found in kurgan 84 of the Uigarak burial site, western Central Asia (Vishnevskaya, 1973: 91, plate XX, *11*). Kiselev dated the arrowheads of this type from South Siberia to the 7th – 6th centuries BC (1951: plate XXVI). The aforesaid suggests that the Mylnikovo arrowhead can be dated to the 7th – 6th centuries BC.

Two-hole battle-axe The axe is quite large and has holes (ears), which pass into a cylindrical rim running around the edge of the ears (Fig. 2, *2*). Griaznov assigned analogous axes to type III, "axes with ears near the bush edge," that originated from the Karasuk type, and, hence, from the earlier Semino axes. These battle-axes were in use during the 7th – 6th centuries BC (Griaznov, 1941: 248, plate I, *7*; V). However, taking into account the date of the inception of the Early Iron Age revised after the excavations of the Arzhan barrow, the most probable date for this type of axe is the 8th – 7th centuries BC. Two-ear axes were often found beyond Siberia. Gorodtsov classified them as specific Cimmerian forms and dated them to the 11th – 8th centuries BC (1928: 54 – 56). Kuzmina related the two-ear axes to Proto-Scythian complexes and dated them to the Late Bronze Age (1966: 21). According to Chernykh and Kuzminykh (1989: 38), specific of later axes is a small roller on the bush mouth. Zbrueva reported the axes of this type found at Proto-Ananino sites (1952: 55, fig. 19, *6*). The closest analogue to the Mylnikovo axe is that from the Bolshoi Log site dated by the excavators as far back as the 10th – 8th centuries BC (Gening et al., 1970: 47). Considering the West Siberian sites of the Bronze to Early Iron Age transitional period, Chlenova dated the Bolshoi Log axe with a roller to the 8th – 7th centuries BC (1994: 71). Ivanov related similar axes to the 8th – 6th centuries BC (1995: 21). We believe that the most appropriate date for this axe is the 8th – 7th centuries BC.

Knife terminating with an arc ("arched tip") (Fig. 2, *1*). Chlenova analyzed thoroughly these articles and determined them as a transitional type of the Karasuk–Tagar knives. These knives were widely spread in Siberia, Kazakhstan, and environs in the 8th – 7th centuries BC (Chlenova, 1972: 124 – 126, plate 57). A series of such knives was found in the Minusinsk Basin (Ibid.: plate 57, *28*, *38*). The following dated complexes yielded the exact analogues of the Mylnikovo knife: Zevakino burial site dated by Arslanova to the 8th – 7th centuries BC (1974: plate III, *1 – 3*), Tomsk burial site (Komarova, 1952: fig. 17, *9*; 20, *7*), Preobrazhenka II burial site (Molodin, 1985. fig. 63, *1*), and the fortified settlement of Chicha-1 (Ibid.: fig. 84, *5*; Molodin, Parzinger, Garkusha, Schneeweiss, Becker, et al., 2001: fig. 3, *1*; Molodin, Parzinger, Garkusha, Schneeweiss, Grishin, et al., 2001: fig. 16, *3*). Thus, the most reliable date of the Mylnikovo knife is the 8th – 7th centuries BC.

Three-groove plaque–buckle (4 items) (Fig. 2, *3*, *4*, *6*, *7*). The most ancient specimens are dated as far back as the 8th century BC. Similar items had survived in all Scytho–Siberian cultures by the 5th century BC (Kubarev, 1990: 55, fig. 12, *2 – 4*; 16, *3*; Chlenova, 1997: 36). In the Upper Ob River region, such plaques were found only at the sites dating to the Bronze to Early Iron Age transitional period, namely, the ground burial site of Blizhnie Elbany VII and XII (Griaznov, 1956: plate XIX, *1*, *10*, XXI, *8 – 11*) and the Zavialovo-1 settlement (Troitskaya, 1968: fig. 46). Chlenova compared the plaques of this type with the 8th – 6th century BC analogues (1997: 36).

Fragments of three-hole cheek pieces (2 fragments; Fig. 2, *5*). Three-hole check pieces were typical of Early Scythian complexes in the Altai and adjacent regions (Vishnevskaya, 1973: plate XXVI; Griaznov, 1980: 64 – 75, fig. 35 – 38; Kiryushin, Tishkin, 1997: 12 – 13). These articles are commonly dated to the (9th) 8th – 6th centuries BC (Griaznov, 1992: 165; Kiryushin, Tishkin, 1997: 75; Marsadolov et al, 1996: 24 – 32). Based on the constructive features of the Elbany finds, Tishkin attributed them to the 8th – 7th or 9th – 7th centuries BC (Tishkin, Mednikova, 1993: 136). Based on an analysis of horse trappings, Bokovenko dated the appearance of curved three-hole horn cheek pieces to the late 2nd millennium BC. He also noted that the tendency to shift the holes toward the center of cheek pieces appeared at the initial stage of the Early Nomad Culture (8th – 7th centuries BC, probably the 9th – 7th centuries BC) (1986: 17 – 18). Thus, all dated objects from the settlement fall between the 8th – 7th centuries BC. Note that some objects, namely, the battle-axe, the knife, the shaft leaf-shaped arrowhead, are dated to the narrower chronological range of the 8th – 7th centuries BC.

Analysis of ceramics

The ceramic complex of the Mylnikovo settlement consists of several thousands of fragments from more than 2,170 vessels. At present, this is the largest collection of ceramics from the south of West Siberia dating to the Bronze to Early Iron Age transitional period. Unlike other settlements that yielded mainly fragmented vessels, Mylnikovo yielded a large number of intact and restorable vessels.

Mylnikovo potters used several initial paste compositions including the following components mixed with dusty or fine silt conglomerates (mainly quartz): (1) clay and hydromica–montmorillonite loams, (2) hydromica–montmorillonite loams, and (3) hydromica–chlorite clays (Table 1).

Analysis of the Mylnikovo ceramics revealed several paste compositions: C (clay) + G (grog, fired clay material) + S (sand) + O (organic filler); C + G + S; C + G; and C + G + RI (rock inclusions) (Fig. 3).

Sand. To identify intentionally added sand in paste compositions, we used the following criteria: (1) grain dimensions (exceeding 0.1 mm), (2) uniform/nonuniform distribution of inclusions in a fragment, (3) a clear/unclear boundary between the cement sand (first dimensional range) and the psammitic material of admixtures (second dimensional range), and (4) significant/insignificant concentration of admixture (Bobrinskiy, 1978: 108; Magetti, 1982: 130 – 131).

Mylnikovo ceramics are composed of sedimentary clays and loams, and, hence the starting ceramic paste contained a large portion of sand. Microscopic analysis showed that grains of sand ranged from 0.05 to 0.7 mm, and sand content was 5 – 45% (the dominating percentage was 15 – 25%). Generally, sand grains were smoothly rounded, half-rounded, or angular. In certain combinations, such as a concentration of 20% and higher and the dominance of middle-sized grains (0.2 – 0.5 mm), we tend to consider sand inclusions as artificial additives.

Thin section petrography showed that the main minerals in the paste composition were quartz and feldspar; more rare minerals were microquartzites, flints, and micaceous siliceous schists; and single minerals were acid effusive rocks, mica, clay–mica fragments, epidote, zircon, and hornblende.

Grog comprises angular grains of irregular, elongated, and rectangular forms. The grog texture also often contains sand inclusions. Grog inclusions are 0.1 – 2.5 mm in size, and their concentration ranges from 5 to 30%.

Organic inclusions. In some specimens, we found round red-brown or brown phosphate inclusions and small round carbonized grains. Traces of organic inclusions are clearly seen in fresh fractures under binocular examination. The inclusions are preliminarily determined as guano.

Rock inclusions. Petrographic analysis of eleven samples showed that one of them contained grains of quartz and feldspar (fresh, intensely sericitizized grains), microgranites, siliceous rocks, micaceous and micaceous–siliceous schists, and microquartzites. These inclusions comprised 57% of a thin section area. Note that this thin section was decorated with cross imprints. A binocular examination also showed the presence of rock grains in samples ornamented with a cross pattern (but this is an exception).

Thus, the paste compositions of the Mylnikovo ceramics can be classified as miscellaneous. The C + G composition was identified in individual samples. Grog was the main filler in all the samples examined. Therefore, the Mylnikovo paste compositions can be classified as a "grog-based tradition." However, we note that another tradition based on the addition of sand or, to be more precise rock grains, was also revealed at this site. This composition is typical of the ceramics from the Siberian taiga sites.

Ceramic objects from the Mylnikovo settlement were produced by different technologies. We established several standardized methods for the initial formation of vessels and constructing vessel bodies. The Mylnikovo collection contains vessels with round and flat bottoms. In the production of round-bottom vessels, potters first shaped a vessel body (body-based process). The bases of round-bottom vessels were formed from low "bowls" by the braid method (dominating) or the patch procedure (Fig. 4, 5).

Most round-bottom vessels were formed from the bottom using an initial flat base (Fig. 6). The base was made of a brain coiled from the outer edge to the center. As a result, a potter produced a bottom with

Table 1. Results of thin section petrographic analysis of ceramics from Mylnikovo

Sample number and code	PC components	Cement composition	Sand			Grog		Cracks, % of the thin section area
			Dominating grain size, mm	% of the thin section area	Composition	Grain size, mm	% of the thin section area	
M – 2 PM-3 14/5	C + G + S + O	Montmorillonite clay with a hydromica additives	0.08 – 0.5 0.15 – 0.3	18	Qu, FS, microquartzite fragments, silica, hydromicaceous-siliceous schists, and single fragments of acid effusives and mica	0.3 – 1.5	10	3
M – 5 PM-K 10/8	C + G + S	Fine loam, hydromicaceous montmorillonite	0.1 – 0.25	5	Qu, FS; rare inclusions of silica and hydromica clays; single fragments of epidote, mica (biotite), and zircon	0.1 – 1.5	25	Less than 1
M – 6 PM-86 U/14	C + G + S	Medium loam, hydromicaceous montmorillonite	0.05 – 0.65 0.06 – 0.15	18 – 20	Qu, FS; rare fragments of microquartzite and hydromicaceous-siliceous schists; and single fragments of hornfels, colorless and green mica, epidote, rhombic pyroxene	0.3 – 0.7	12	5 – 8
M – 8 PM-B 12/4	C + G + S + O	Hydromicaceous-chlorite clay	0.05 – 0.7 0.1 – 0.25	23 – 25	Qu, FS, fragments of microquartzite and silica; rare inclusions of hydromicaceous-siliceous schists; single fragments of effusives, muscovite and green mica, epidote	0.1 – 1.0	12 – 15	10
M – 16 PM	C + G + S	Coarse loam, hydromicaceous montmorillonite	0.05 – 0.5 0.08 – 0.15	10 – 12	Qu; rare fragments of FS, microquartzite, silica, hydromicaceous-siliceous schists; single inclusions of mica and epidote	0.3 – 1.6	25	1 – 2
M – 17 PM-G 12/4	C + G + S	Montmorillonite-hydromicaceous clay	0.1 – 0.4	15	Qu, FS; rare fragments of silica, hydromica-silica, clay, microquartzite, acid effusives; single inclusions of epidote and mica	0.1 – 2.0	30	?
M – 18 Area III, V 1/6	C + Pl + G	Coarse loam, hydromicaceous montmorillonite	0.1 – 0.3	57	Qu, FS (fresh intensely seritisized grains, epidotized), fragments of microgranites, siliceous rocks, hydromicaceous and hydromicaceous-siliceous schists, microquartzites; rare grains of epidote, ore minerals, and muscovite mica	0.1 – 1.0	5	3
M – 19 Area III, G 1/6	C + G + S + O	Medium loam, hydromicaceous montmorillonite	0.05 – 0.25 0.1 – 0.2	20 – 25	Qu, FS; rare fragments of microquartzite, hydromicaceous-siliceous schists, single fragments of muscovite and green mica, epidote	0.25 – 1.2	15	1 – 2
M – 20 PM-A 15/2	C + G + S + O	Fine loam, hydromicaceous montmorillonite	0.1 – 0.3	30	Qu, FS; rare fragments of microquartzite, hydromicaceous-siliceous schists, single fragments of muscovite mica and biotite, anatase, and epidote	0.1 – 2.0	22	3
M – 21 PM-area III R 1/5	C + G + S	Medium loam, hydromicaceous montmorillonite	0.1 – 0.35	45	Qu, FS; rare fragments of silica, microquartzite, hydromicaceous-siliceous schists, abundant acid effisives, epidote, mica	0.25 – 2.5	5	Less 1
M – 28 PM-U 10/7 border	C + G + S + O	Hydromicaceous-chlorite clay	0.05 – 0.5 0.1 – 0.3	40	Qu, rare grains of FS, microquartzites, silica rocks, hydromicaceous-siliceous schists, muscovite and green mica; single inclusions of epidote	0.35 – 1.8	15	5 – 8

Note. PC – paste composition, C – clay, G – grog, S – sand, O – organic component, Qu – quartz, FS – feldspar, RI – rock inclusions.

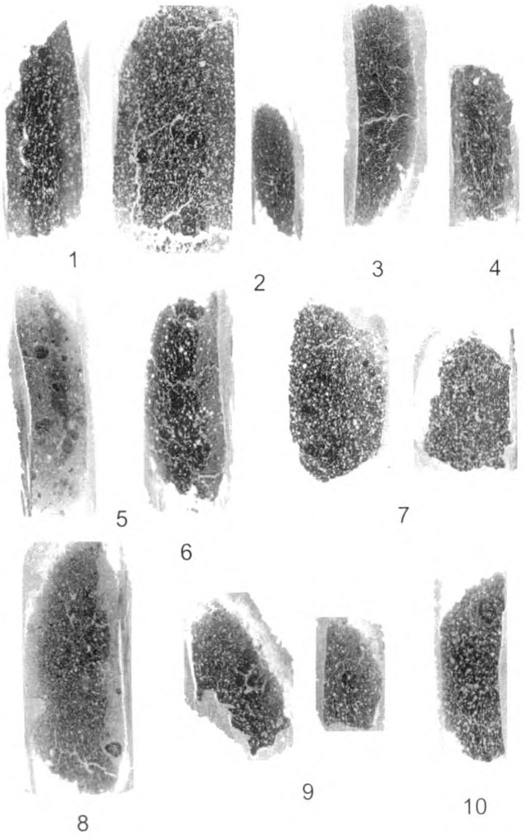


Fig. 3. Petrographic thin sections of ceramics from Mylnikovo.
1 – M-2, *2* – M-5, *3* – M-6, *4* – M-8, *5* – M-16, *6* – M-17, *7* – M-18, *8* – M-19, *9* – M-20, *10* – M-21.

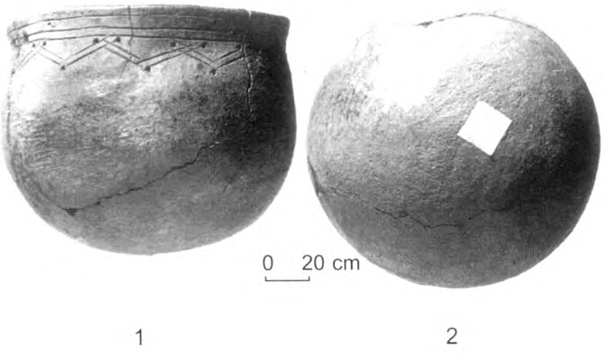


Fig. 4. Round-bottom vessel from Mylnikovo (body-based process).
1 – outer surface, *2* – base.

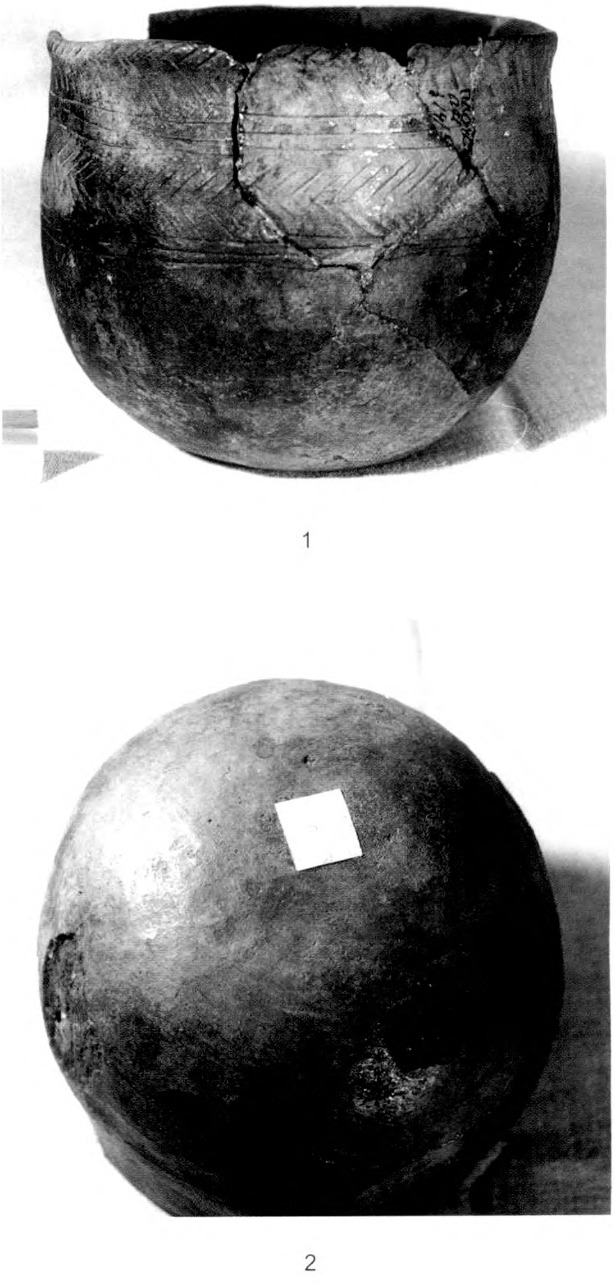


Fig. 5. Round-bottom vessel from Mylnikovo (body-based process).
1 – outer surface, *2* – base.

an elevated central part. In some cases, we revealed bases made of a single patch, and in three cases, a complex bottom made of two thin bases.

We fixed several methods for joining the bottom with the vessel body.

1. The lower band-brain was attached to the bottom; in this case, there is a clear groove around the base perimeter on the inner side of the bottom (Fig. 7). Joining from the inside involved removing the excess clay from the band to the bottom, whereas joining from the outside implied removing the clay from the bottom to the band. Therefore, most vessels have a smooth transition from the bottom to the vessel wall. There are also bottoms with a small border (Fig. 8).

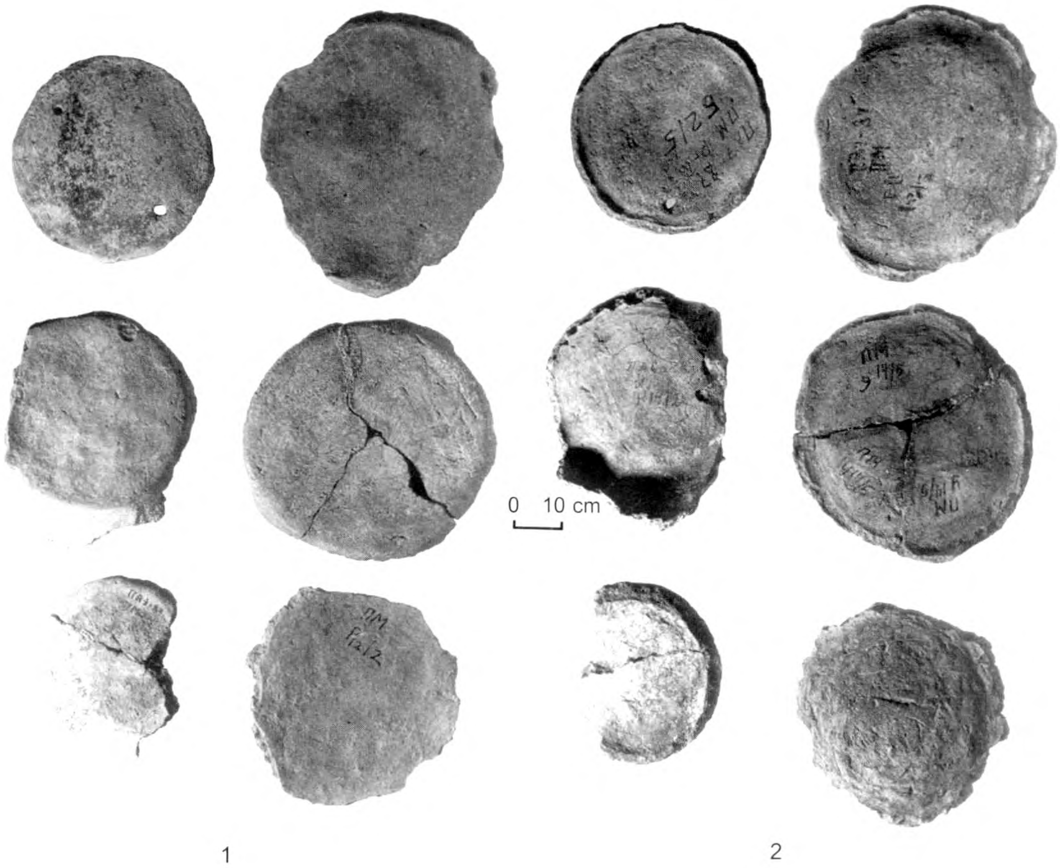


Fig. 6. Bottoms of vessels from Mylnikovo. Initial flat bases.
1 – outer surfaces, *2* – inner surfaces.

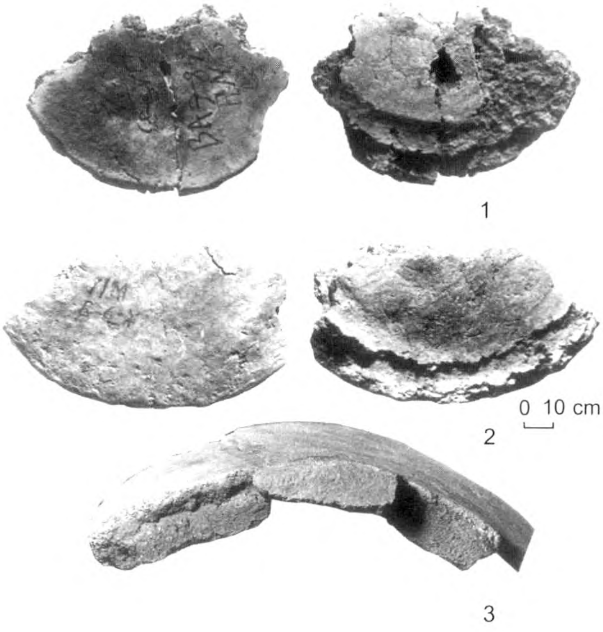


Fig. 7. Bottoms of vessels from Mylnikovo. Joining of the bottom and the lower band.

2. The first band–braid was attached around the bottom. From the outside, the excess clay was removed from the wall to the bottom, and from the inside, from the bottom to the wall. For this reason, bottom folds are clearly seen. In some cases, a shallow "groove" is seen along the bottom fold parallel to the bottom perimeter. The groove marks the attachment of the outer wall surface to the vessel bottom (Fig. 9, 10).

Vessels were formed from the bottom to the mouth, as evidenced by positive and negative sides of bands and the bottom thickness, which exceeded or was equal to the thickness of near-bottom walls. The principles of forming vessel bodies cannot be precisely reconstructed. In all restorable cases potters used finely formed, thin braids (up to 1.5 cm, rarely 2 cm in diameter), overlapping one another by 1/3 of their height. Obviously, band–braids rather than braids were a basic construction element (Fig. 11 – 13). Some vessels were formed by the band method. Necks were mainly formed of one band of height ranging from 1.5 to 3 cm.

Vessels were formed on a flat surface (Fig. 14). Although, the bottoms are smoothed and glossed, their

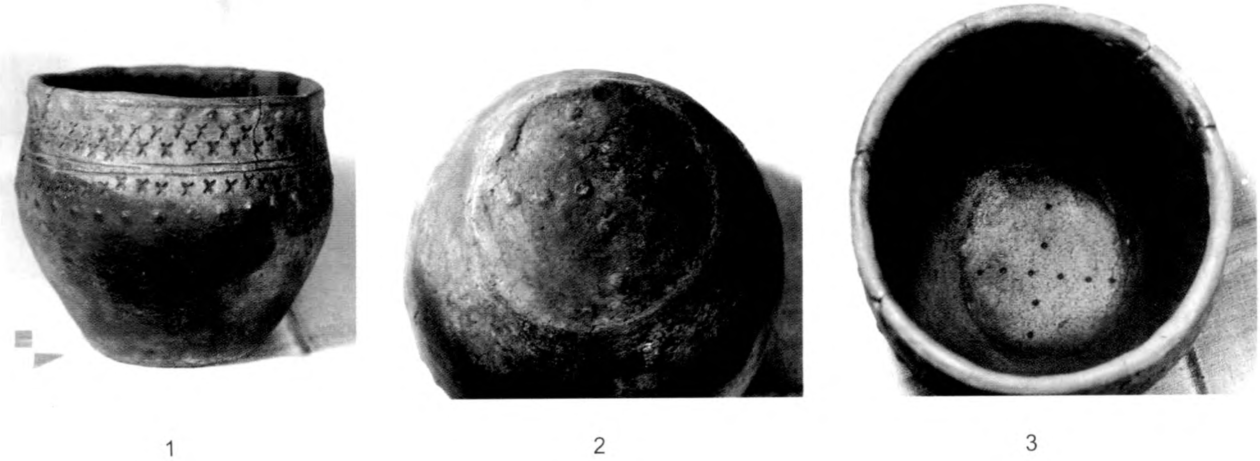


Fig. 8. Flat-bottom vessel from Mylnikovo. Initial flat base.
1 – outer surface, *2* – bottom (shaping on a soft surface), *3* – inner surface.

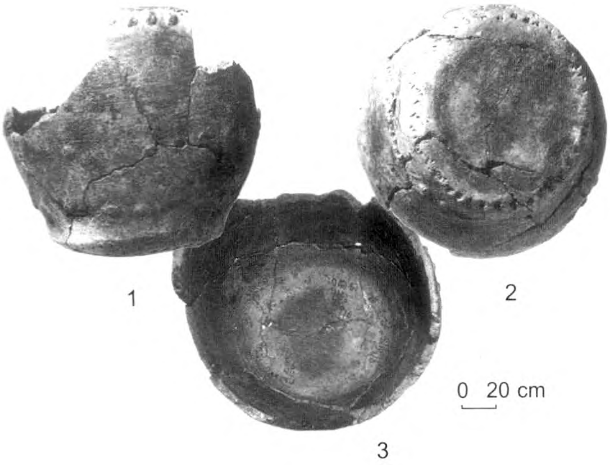


Fig. 9. Flat-bottom vessel from Mylnikovo. Initial flat base.
1 – outer surface, *2* – bottom with traces of a shovel,
3 – inner surface.

outer surfaces have traces left by a rigid surface, from which they were then taken off by a shovel (see Fig. 9 and 10). Sand was often used as a substrate (see Fig. 13). Some vessels were formed on a soft rather than a rigid surface (see Fig. 8).

The vessel surface was finely smoothed and often finished by glossing. The surface was smoothed by a rigid tool with a rough working edge (wooden chip), whose traces are seen as small grooves of different depth, width, and form, stretching in different directions, etc., or a shovel 1.5 cm in width, with a straight edge. However, traces from these tools were seen only in some cases because the vessels were finely finished, which included smoothing or polishing surfaces with hands or glossing walls with

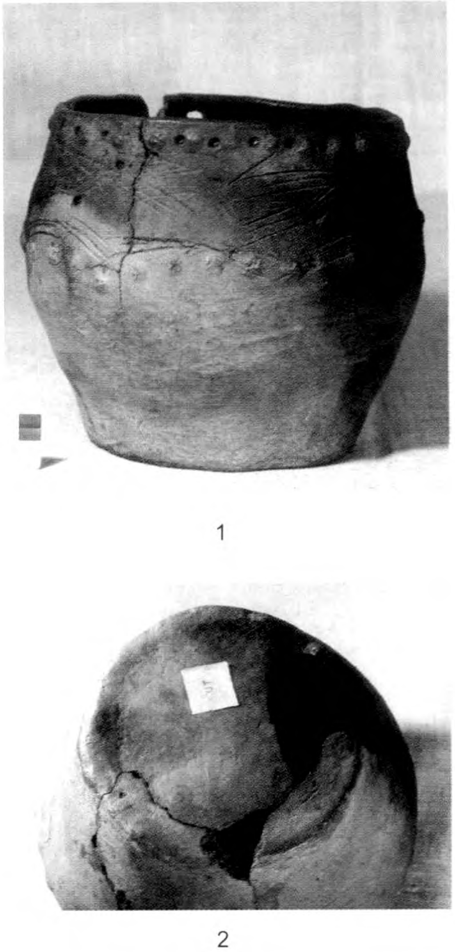


Fig. 10. Flat-bottom vessel from Mylnikovo.
Initial flat base.
1 – outer surface, *2* – bottom with traces
of a wooden shovel.

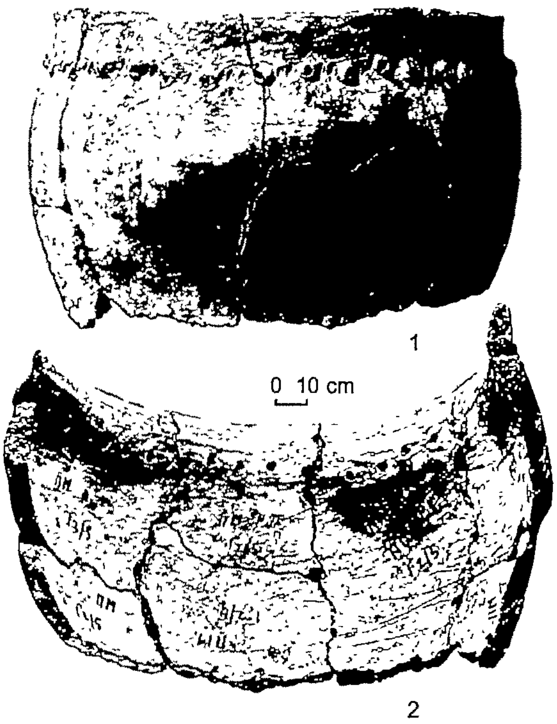


Fig. 11 Sample of band/braid joining.
1 – outer surface, *2* – inner surface of a vessel

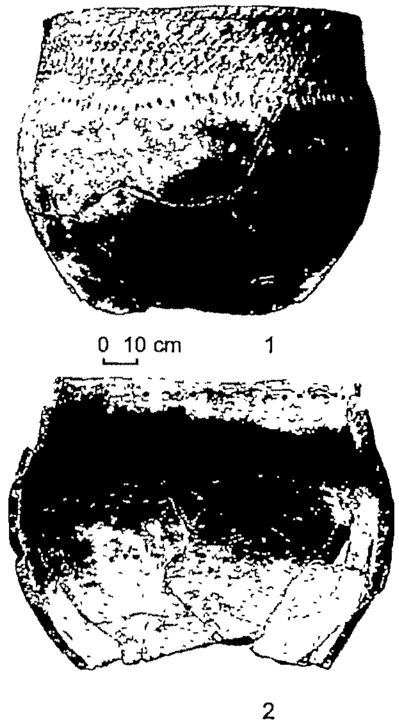


Fig. 12 Sample of band/braid joining.
1 – outer surface, *2* – inner surface

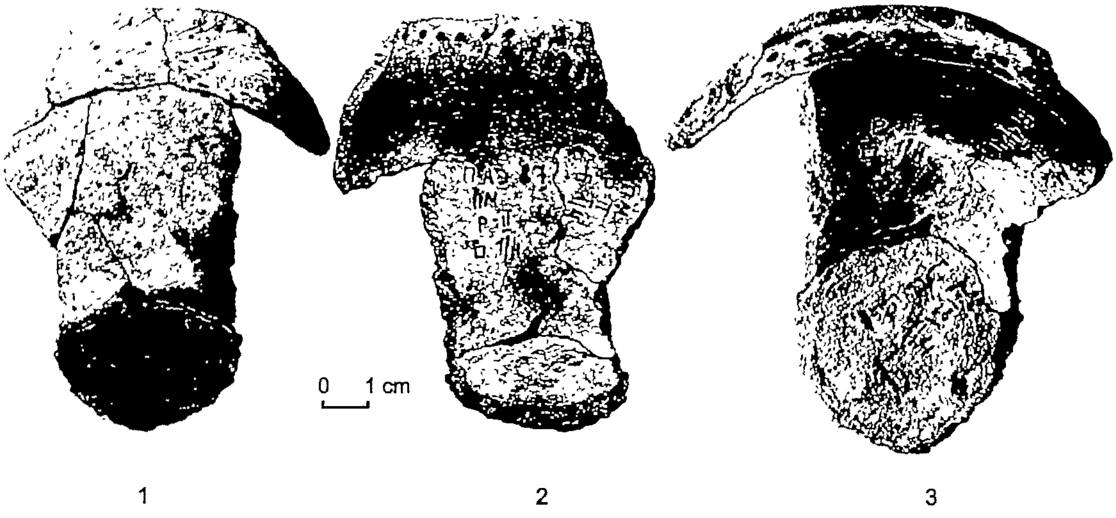
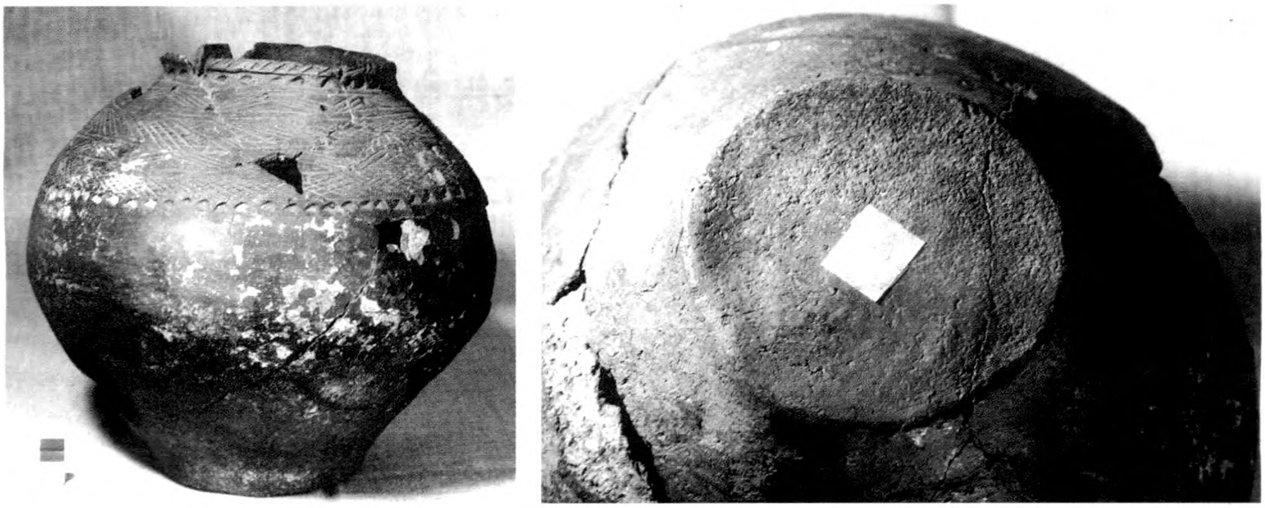


Fig. 13. Flat-bottom vessel from Mylnikovo. Initial flat base.
1 – outer surface of a vessel with traces of sand on the bottom, *2* – inner surface with traces of finishing,
3 – example of joining of the base with the body

a rigid tool with an even working surface. Note that 30% of all vessels were glossed from the inside. The interior of others was only smoothed. The outer surface was always glossed after decoration (90% of glossed ornamented vessels) (see Fig. 14).

The technical–technological characteristics revealed by our analysis show that the ceramic complex of the Mylnikovo settlement included at least three different traditions. The Irmen component was revealed by the grog-based paste compositions,



1 2

Fig. 14. Flat-bottom vessel from Mylnikovo. Formation of a vessel on a rigid surface.
1 – outer surface with traces of glossing, *2* – bottom.

methods for forming round-bottom vessels, band technique, and glossing the ornamented surface. This tradition was present in the ceramics from the Baraba sites of the Bronze to Iron Age transitional period (Molodin, Parzinger, Garkusha, Schneeweiss, Grishin, et al., 2001: 149 – 150; Mylnikova, Chemyakina, 2002). The Korchazhkino tradition implied the use of a patch base and predominant band-braids. Ceramic pastes with rock grains reflect the presence of the third, "northern" component.

There are two groups of vessels: with flat bottoms and round bottoms. The group of flat-bottom vessels includes the following types: pots, jugs, and jars. The group of round-bottom vessels includes semispherical dishes with a straight rim and small profiled vessels. The types of ceramic objects were distinguished* using a program developed by Gening (1973, 1992), which takes into account the height indices for the neck (FB), body (FE), and shoulder (FF). The FE index, which is the ratio of the sum of the heights of the shoulder and the base to the maximum body diameter, determines the general profile of the vessel body. For jars, the values of the FE index range from 0.4 to 1.6 (a.u., absolute units). The vessels whose FF index (ratio of the shoulder height to the height of the base) is smaller than 0.4 and the maximum body diameter is 2.5-fold greater than the vessel height are classified as dishes. The vessels whose FF index exceeds 1.7 and the total vessel height is two times greater than the maximum body diameter are classified as jugs. The FB index determines the neck height with respect to the neck diameter; if the height of a vessel neck is two times smaller than the diameter of the neck base, this vessel is identified as a pot, and if this parameter is 0.5-fold smaller, it is classified as a jug.

The main criterion for distinguishing subtypes is the neck profile determined by the flexure of a neck from the base (FD). Pots can be with (1) a smooth profile, (2) a prominent profile, (3) with a neck bent outward ("Molchanovo type" neck), and (4) a straight rim (transitional to jars). Jars can be open and covered. There are no dominating subtypes among pots.

Three ornamental schemes are typical of the Mylnikovo ceramic tradition. The first scheme, called the Korchazhkino tradition, has the following most popular patterns: horizontal herring-bone (18.5% in the entire collection), a double net pattern (15.3%), and a double net pattern depicted with incised lines, zigzags, and small pits (Table 2). A row of "pearls" running around the neck is also typical of the Mylnikovo ceramics; more rarely, rows of "pearls" are doubled or decorate the upper lip. One vessel has five rows of "pearls." A rarer decorative pattern was rows of oblique imprints. We failed to reveal any regularity in the zonal distribution of the ornament. Generally, the ornament covered the upper part of vessels, reaching the shoulders but it rarely covered even 50% of the total vessel area. In some cases, the ornamental scheme is finished with triangular figures depicted by various imprints. The first model has the following specific features: multiple rows of decorative patterns, the presence of eight to ten rows of ornament on one vessel (Fig. 15 – 17). The neck zone is marked

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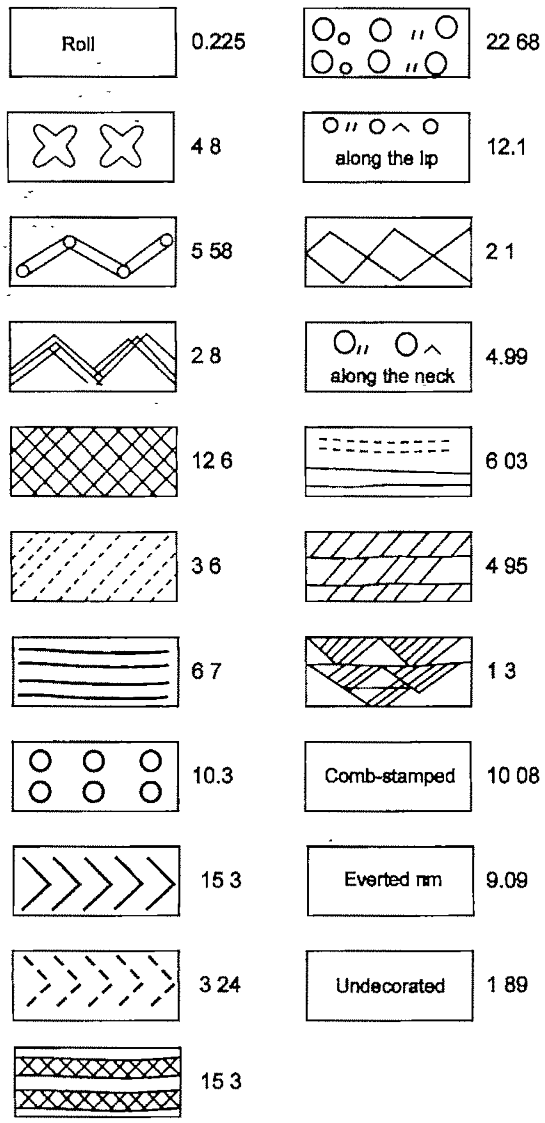
* Here "ceramic objects" or "ceramics" means ceramic household utensils.

Table 2. Decorative patterns on the ceramics from Mylnikovo, %


Roll
0.225
4.8
5.58
2.8
12.6
3.6
6.7
10.3
15.3
3.24
15.3
22.68
along the lip
12.1
2.1
along the neck
4.99
6.03
4.95
1.3
Comb-stamped
10.08
Everted rim
9.09
Undecorated
1.89

with a row of pearls or incised lines. The ornamentation of small vessels mainly repeats the decorative scheme for large vessels but instead of the double row of pearls, potters used imprints from a stick or straight imprints of a net pattern or zigzags between them. Most vessels decorated according to the first scheme have rims of the "Molchanovo" type. Within this decorative model, certain elements of the ornament are substituted by other elements, though the general ornamentation scheme is preserved. For example, the altering patterns are incised lines, rows of small pits and pearls, which can be substituted by cross-shaped imprints (Fig. 18). Rows of net imprints can also be substituted by the rows of horizontal herring-bones, zigzags, or crosses. The pearls are separated by small pits, crosses, triangular imprints, etc.

The second scheme is characterized by the same elements and motifs as the first scheme, but the ornament is concentrated in the upper third of vessels. Most often, the vessels are decorated by two rows of pearls separated by two rows of net or herring-bone pattern or oblique imprints sometimes separated with small pits or incised lines. The second scheme, as well as the first one, uses imprints of a cross pattern (Fig. 19). We believe that the second model is a result of transformation of the first one and is analogous to the decoration of ceramic ware from the Blizhnie Elbany stage of the Bolsherechenskaya Culture (7th – early 6th centuries BC) (Shamshin, 1988c, 1989): Blizhnie Elbany I, Elbanka, Elunino cult site.

The third scheme of the Mylnikovo settlement can be conventionally called "Proto-Biysk" scheme because its composition generally corresponds to that on the ceramics of the Biysk stage (after (Griaznov, 1956: 86, fig. 16; 89)). It is typical of open or covered jars, which are mainly decorated with single or double rows of pearls often separated by triangular imprints. The ornamental field between the rows is filled with incised lines or a rarefied net; sometimes, the composition is finished with a row of triangular impressions. There are also small semispherical bowls decorated with incised lines (Fig. 20). Note that the objects decorated according to this scheme are rare compared with the total number of vessels and were found mainly in squares Y, Ф, and X of excavation area I at the Mylnikovo settlement.

Generally, the most typical patterns for the entire ceramic complex were double rows of pearls with separators (22.68%) and without them (10.3%) (see Table 2). The main decorative patterns were single and double rows of net (12.6 and 15.3%, respectively), horizontal herring-bone produced by smooth and comb imprints (15.3 and 3.24%, respectively), and zigzag (8.38%). Pearls were arranged mainly in one or two rows in the upper part of the rim (12.1%) and on the neck (4.99%). Despite that figured imprints seem to be used quite often, its portion in the entire collection is rather small (4.8%). The vessels were ornamented by smooth imprints and incisions. Ceramics decorated with comb imprints is 10.08% of the total number of vessels.

Conclusions

At present, the ceramic complex of the Mylnikovo settlement is one of the most representative collections of the Upper Ob River ceramics of the Bronze to Early Iron Age transitional period. This complex demonstrates the continuity of the decorative and technological traditions of the Late Bronze Age during the transitional period. However, it was

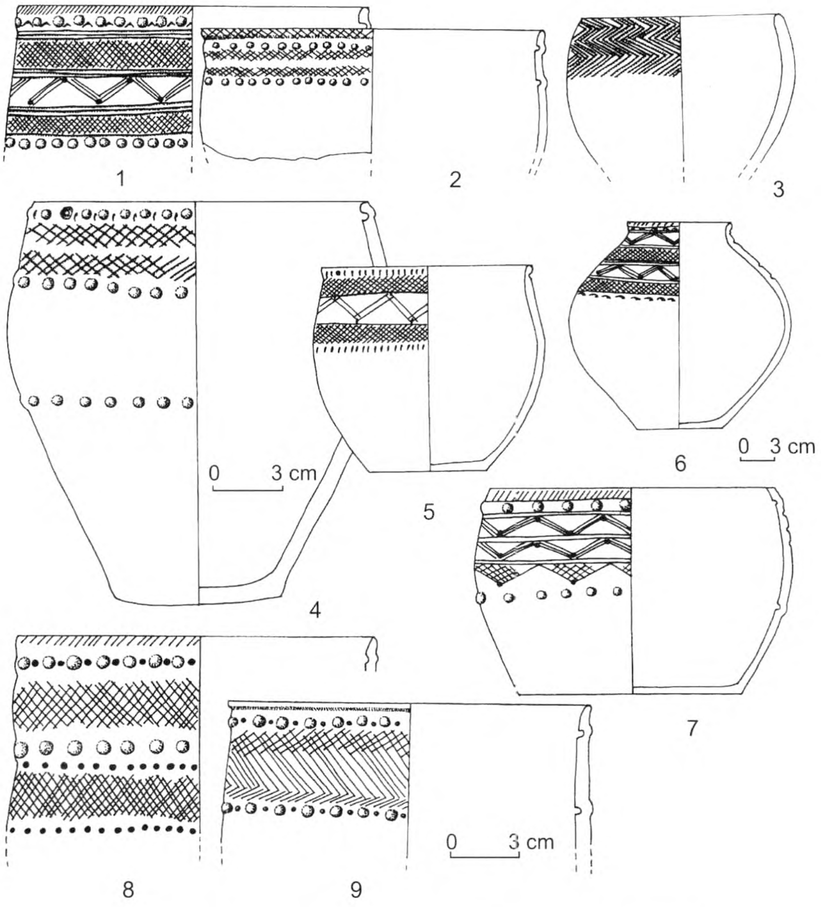


Fig. 15. Ceramics from Mylnikovo. The first decorative group.

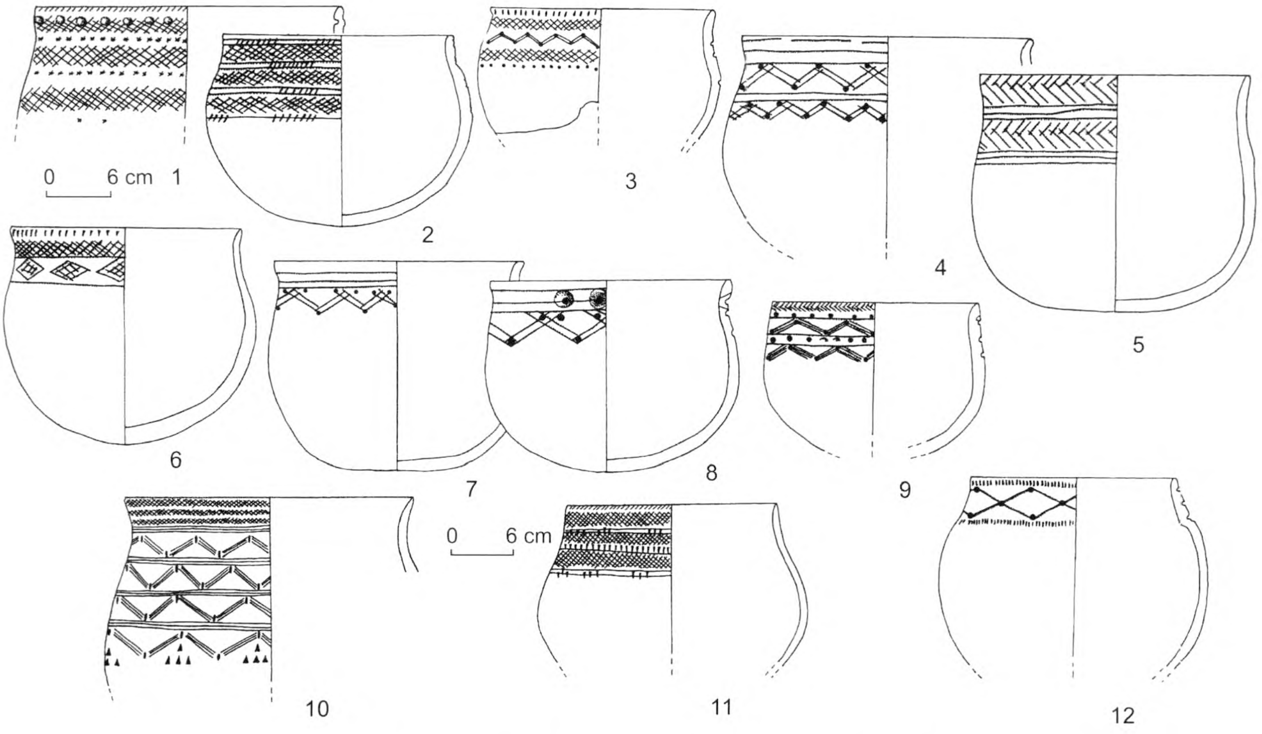


Fig. 16. Ceramics from Mylnikovo. The first decorative group.

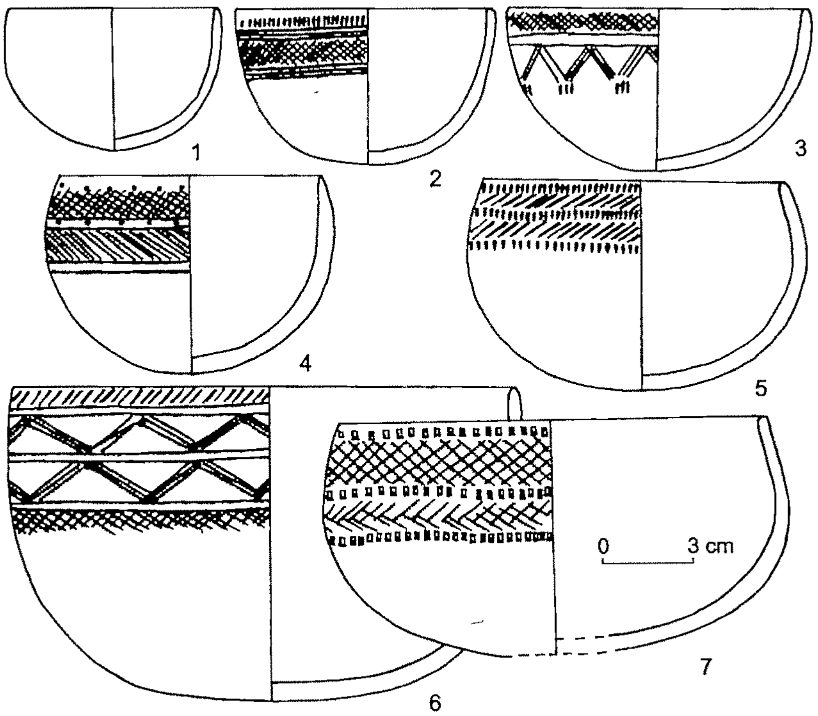


Fig 17 Ceramics from Mylnikovo The first decorative group.

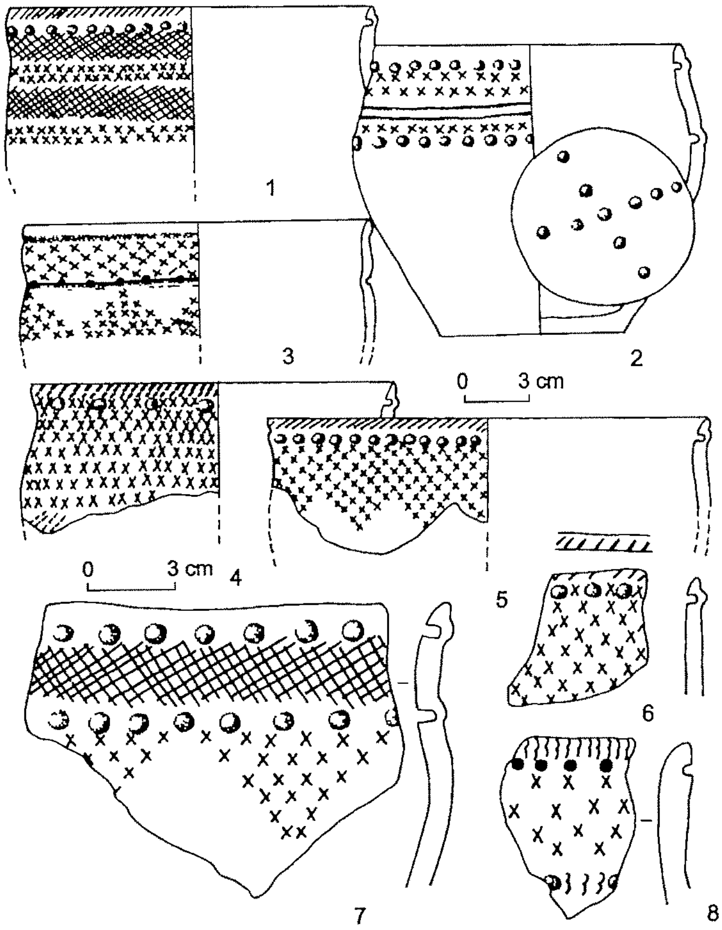


Fig 18. Ceramics with figured imprints from Mylnikovo.

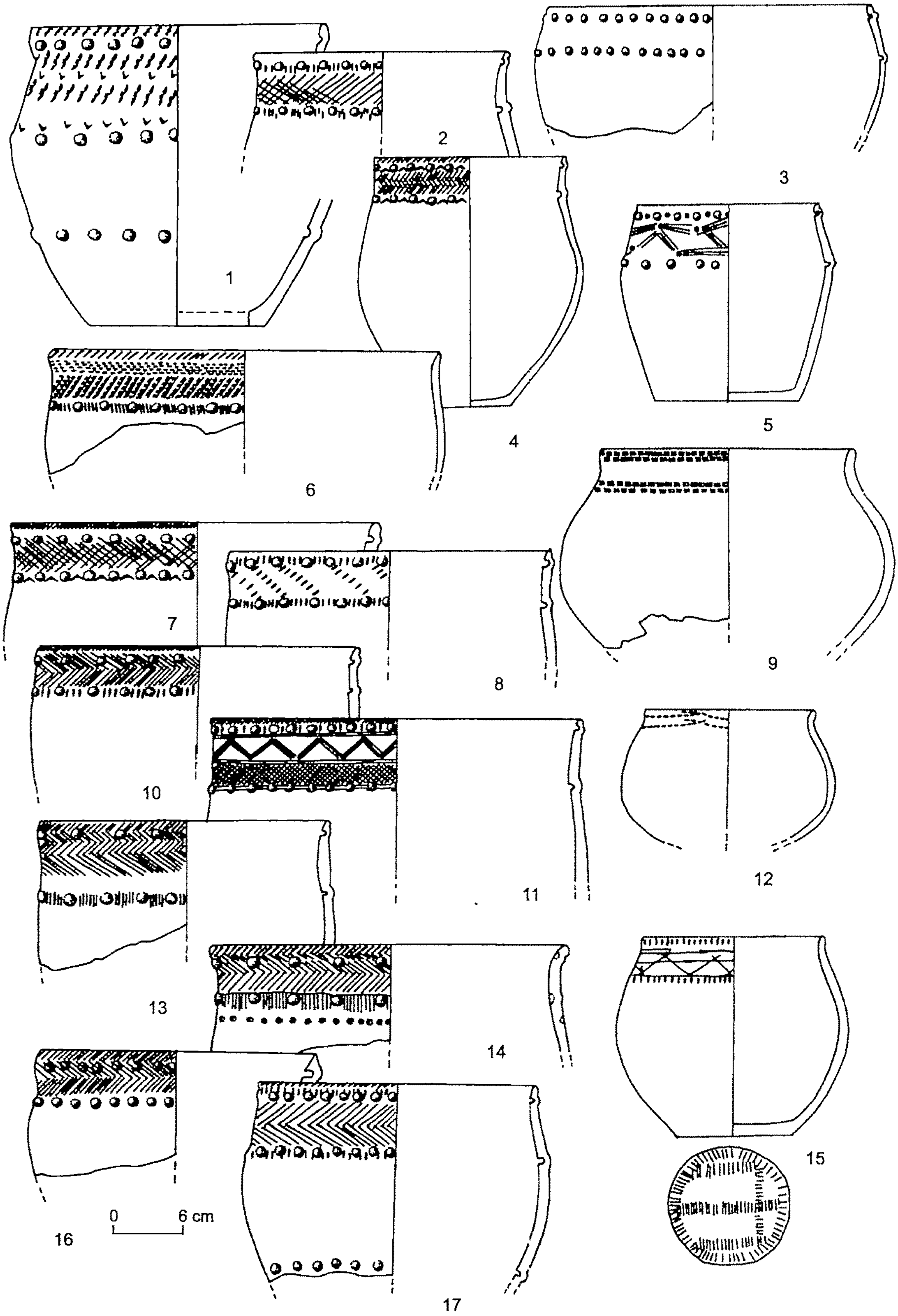


Fig. 19 Ceramics from Mylnikovo. The second decorative group

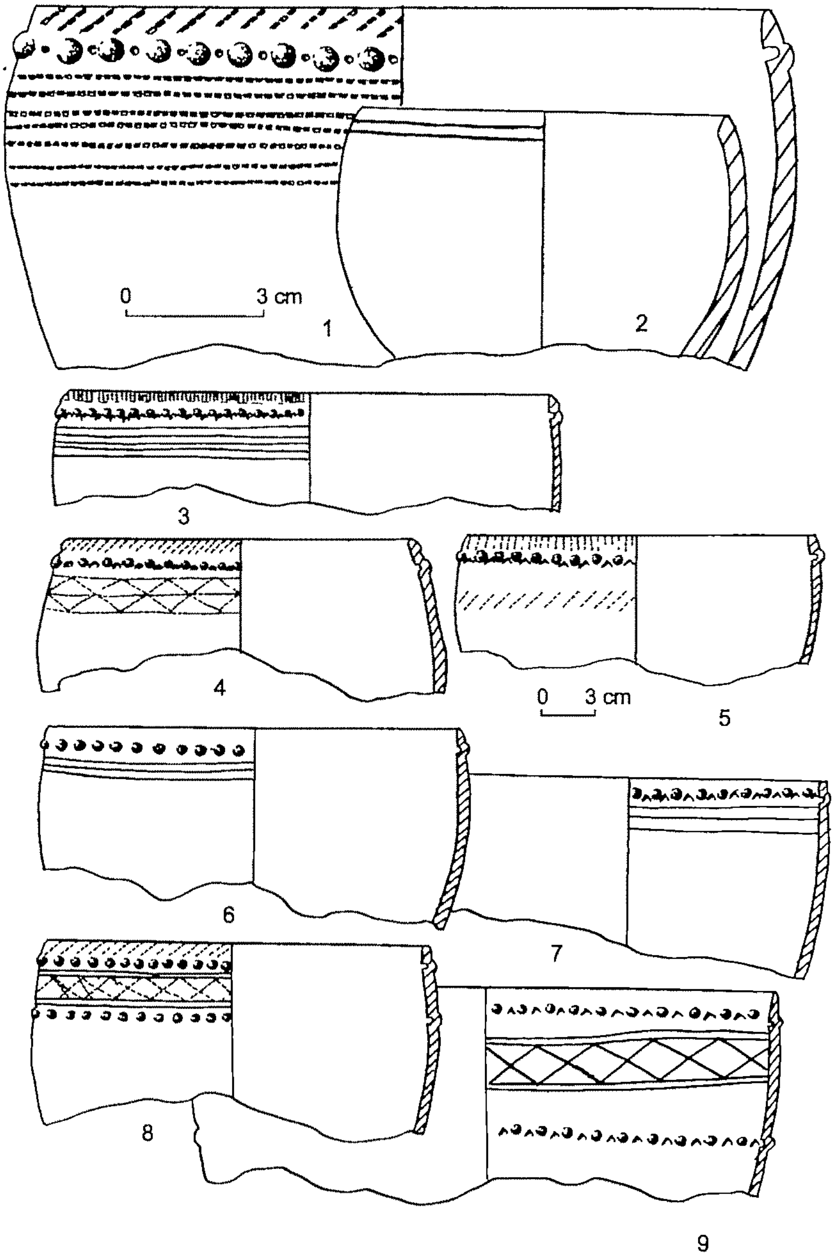


Fig 20 Ceramics from Mylnikovo. The third decorative group

established that Mylnikovo ceramics developed under the influence of an alien ceramic tradition: the ceramic paste contained rock grains and the decoration pattern had elements of figured imprints, typical of the ceramics of the West Siberian taiga zone. However, these elements, namely, cross imprints are rare among Mylnikovo ceramics; moreover, they can be attributed to the Bolsherechensk ornamental scheme (see, e.g., Fig. 16, *1*; 18, *1*). Among the finds, there are objects with a specific Molchanovo neck (0.85%) (the term of "Molchanovo rim" is rather conventional because such necks, being typical of other cultures of the transitional period, such as the Molchanovo Culture, Late Irmen Culture, and, to a lesser degree, Bolsherechenskaya Culture, serve as a cross-cultural feature and a chronological marker) We assume that the appearance of bearers of the tradition of figured imprints did not affect natural trends in the original development of ceramic production. In both technological and decorative aspects, the Mylnikovo ceramics bears traditions stemming from the Late Bronze Age cultures, mainly the Korchazhkino Culture, which is evidenced by the dominating role of net and herring-bone patterns and the ornamental composition based on multiple repetitions of motifs on one vessel, the presence of horizontal separating rows of small pits and incised lines, and the style of decorating vessel shoulders. Most clearly, the Korchazhkino specificity is reflected in the first ornamental scheme. The Irmen component is indicated by jar-like forms of vessels and rows of shaded triangles with vertices facing each other, depicted on the rim, or rows of triangles with vertices downwards, which finish the composition. All these features are rare among Mylnikovo ceramics, though the technical–technological affinity to this tradition is quite clear.

Mynikovo ceramics obviously belongs to a branch of cultural development, which existed in the southern part of the Upper Ob River region during the transitional period, originating from the Late Bronze Age cultures. One of these cultures, the Bolsherechenskaya Culture, resulted from the transformation and evolution of the Korchazhkino–Irmen substrate with the dominating Korchazhkino (Andronoid) component. The Mylnikovo settlement belongs to this culture. Another, the Late Irmen line, presented by, for example, the Malyi Gonbinskiy Kordon 1/3 settlement located 20 km west from Mylnikovo and dating to the same period as the Krestianka IX settlement at the border between the Upper Ob River region and the Kulunda steppe, continues traditions of the Irmen component.

As it has been noted, figured imprints do not disturb the general ornamental scheme of the Mylnikovo ceramic complex but, in contrast, they become an organic element of this scheme: figured imprints substitute for the traditional ornamental elements, but do not create new patterns. This indicates the absence of stable cultural relationships between the Mylnikovo population and their northern neighbors (Papin, Shamshin, 1998; Papin, 2002a, b) and the indirect character of these contacts, which is supported by the data from the Bobrovo ground burial site. The Bobrovo ceramic complex has some items decorated with a cross pattern but, anthropologically, the northern low-faced Mongoloid component was not revealed (Tur, 2001).

At first, Griaznov attributed the Mylnikovo settlement, along with other sites (Bystryanskiy Kordon, Tomsk burial ground, Berezovka settlement, Elban burial site, and Bobrovka settlement), to the Bolsherechensk stage of the Bolsherechenskaya Culture of the Upper Ob River region (1956: 69). After the discovery of Zavialovo I and V, the researchers distinguished the Zavialovo Culture, whose materials were different from the Blizhnie Elbany complexes, closer to the Late Bronze Age materials (Troitskaya, 1968, 1970, 1972). Later, the Blizhnie Elbany I settlement and the Blizhnie Elbany VII, XII, and XIV burial sites were attributed to the Zavialovskaya Culture (Troitskaya, Zakh, Sidorov, 1989: 108 – 109). Thus, the Bolsherechensk stage of the Bolsherechenskaya Culture (after Griaznov) and the Zavialovskaya Culture (after Troitskaya) are characterized by the same sites (Blizhnie Elbany I, VII, XII, and XIV, Tomsk burial site, Zavialovo I and V, and Linevo I). In fact, this means that all scholars admit that in the transitional period, a unified culture existed on the banks of the Upper Ob River, and the Mylnikovo settlement must be considered within this cultural tradition.

Note that the presence of three decorative patterns and some other factors evidence that this settlement existed for quite a long period.

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ROLE OF TEXTILES AND CLOTHES IN THE RITUAL PRACTICE OF THE OB UGRIANS

Introduction

There is a common opinion among scholars that fur clothes appeared in the culture of the Ob Ugric people (Ugrians) earlier than woven clothes (Karyalainen, 1995: 59; Gemuev, Sagalaev, 1986: 146; Fedorova, 1994: 205, Gemuev, Baulo, 2001: 24; Baulo, 2002: 66, etc.). However, this statement is still disputable. Kodolanyi Jr. was the first who highlighted the role of textiles in the Khanty culture and emphasized the necessity to study the use of using fur and fabrics in the traditional costume (see (Lukina, 1985: 148)). Prytkova noted that nettle linens were commonly used by the Khanty and Mansy to make shirts (Prytkova, 1953). To support an idea about the indigenous, original production of woven clothes in the Khanty culture, Lukina listed common Ob–Ugric (Finno–Ugric) names for coarse fabrics of plant or even wool fibers and referred to the late 2nd – early 1st millennium BC Elovo burial sites, whose materials indicated the use of threads spin of wild hemp. She explained the appearance of weaving and the loom in the Khanty culture by the Finno–Ugric influence (Lukina, 1985: 152 – 154) rather than the Tatar (as suggested by Sirelius (1906) and later by Popov (1955)). Lukina's opinion was then supported by Fedorova (1994), who studied the Mansy material culture, and Bogordaeva (2001), who used the traditional Khanty costume as an example. Obviously, fur was assumed to be the first material for making clothes as evidenced by the 17th – 18th century travelers and 19th – 20th century historians, who noted the use of fish and animal skin: "Originally, the Khanty sewed their clothes of hides and fish skin and they knew how to spin fibers from the Tatars, their southern neighbors" (Izdeliya Ostyakov..., 1911: 58 – 59), or "Even fifty – sixty year ago, the Ostyaks wore clothes made exclusively of animal hides and fur" (Startsev, 1928: 29). Novitskiy collected valuaeble materials, which Patkanov (1999: 51) and other 19th – 20th century scholars later used. Prytkova (1953: 124), who examined the Mansy traditional costume, reasonably noted that the 17th – 18th century travelers were particularly interested in the clothes of indigenous people because they were mainly attracted by their unusual material. For example, although Novitskiy describes woven fabrics (linens, plain cloth, damask) along with other garments made of hides and fish skin, all scholars became primarily interested in the use of exotic materials. Moreover, the idea of the minor use of fabrics could have been promoted by Sirelius (1905, 1906), who proposed a hypothesis that the loom was borrowed from other cultures. We can only add that the Ostyak and Vogul clothes were mainly described by men, who were quite remote from the questions of weaving and sewing. Therefore, their information can be inaccurate

Thus, the question of materials for Ob Ugrian clothing remains open. On the one hand, it is related to other unsolved problems, such as the problem of Ugric genesis. On the other hand, the information of the 17th – 20th century travelers and first scholars is difficult to prove and subject to critical analysis. During the last five centuries, the traditional Khanty and Mansy costume changed significantly due to intensive cultural contacts with the Turks and later with the Russians. Moreover, it is rather problematic to reconstruct adequately the traditional costume of

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the Ob Ugrians because it has many specific local features pertaining to the Southern, Northern, and Eastern groups of this ethnic community (Bogordaeva, 2001). At present, we can consider only some traditional elements of their costume. From literary data (Prytkova, 1953; Lukina, 1985, Fedorova, 1994, etc.), these elements were tunic-like shirts, belt-sash *vorup (veryp)*, gowns of woven fabrics, various types of scarves or shawls, male trousers, and fur coats. One can see that the textile clothes played an important role in the traditional culture (by analogy with "fur clothes," below it is called "woven clothes").

However, there is no direct evidence of the very ancient use of woven clothing. Medieval textiles found at archaeological sites of West Siberia could have contributed to the solution of this problem, but this archaeological data has not yet been thoroughly analyzed. Therefore, we can use only the scanty information available to us, such as the broad use of textiles and woven clothes in ritual practices of the Ob Ugrians. Fedorova used this argument to prove the ancient traditional use of shirts by the Mansy population before the arrival of the Russians (1994: 121 – 122). In her historical ethnographic studies, Fedorova proposed that the Mansy had a straight tunic-like garment similar to that used for *ittarma* (a doll serving as a container for the soul of the deceased). The ancient use of various pieces of clothing in ritual practice is considered substantial proof of a long tradition of producing these articles. This is quite reasonable because the conservative nature of forms and methods of cult practices (Gemuev, Sagalaev, 1986: 5) ensures the preservation of long-term traditions. It is also obvious that things alien to this culture could no be used in sacrifices and other cults. Therefore, it is of interest to consider the functions of textiles in ancient Siberian traditions connected with the life cycle. These are the childbirth ritual, weddings, funerals, sacrifices, and the Bear Festival. Below, we also consider clothes of deities, spirits, and *ittarma*.

The childbirth ritual

The childbirth ritual in the culture of the Ob Ugrians involved the use of many attributes related to textiles and woven clothes.

A doll made of cloth symbolized Kaltashch-anki, a goddess who patronized women and helped them during childbirth, and indicated the relationship between this goddess and a future mother (Isaeva, 1994: 11). Pieces of cloth hanging on trees growing in sacred places served as sacrifices to this goddess, or spirits, who were asked to deliver help in childbirth or thanked for a successful delivery (Ibid.: 12). A baby was wrapped in cloth not only to warm him up, but also to protect him from evil spirits. For this purpose, parturient women wore old clothes, and baby's first swaddling bands were made of old, worn out clothing.

The shawl also played an important role in the childbirth ritual· a special shawl was placed in a frame, whereas other shawls were hung to trees and in sacred places, serving as symbolic gifts to the Kaltashch goddess. A shawl was given to a woman who cut the umbilical cord for her assistance in the delivery. The best gift to the goddess after a woman gave birth was also a shawl. It was presented so that, "the baby would be healthy and everything would be fine." The shawl was a symbol of Kaltashch-anki (Martynova, 1992: 77 – 78), whose doll (idol) was wrapped in the shawl.

The elements of the costume, such as gowns, shirts, dresses, and belts, also played a special role in this cult. A special gown was sewn to imitate the Kaltashch goddess, a shirt for wrapping the placenta was also sewn for this special occasion, a certain type of belt was placed in a frame, and shirts and dresses were given to Kaltashch-anki (Isaeva, 1994: 13). In this case, these elements of costume were sacrificial gifts to the goddess.

In this ritual, color was also very important: only white (light colors) and red fabrics and clothing were used. White symbolized goodness, happiness, and luck (Kulemzin, 1983: 125), while red was a symbol of fire. Many scholars identify the Kaltashch's role in the ideology of the Ob Ugrians with the image of Mother Fire, thereby explaining a tradition to present her with red shawls, dresses, etc. Red, i.e., the color of fire, performed two functions: a purifying function and a protecting function (children were often left alone at home in fire's care) (Martynova, 1992: 81).

The wedding ceremony

In the wedding ceremony, cloth performed two main functions: social (material) and symbolic. Pieces of cloth were a great part of the bride price and marriage portion. The richer the marriage portions were, the richer the bride and bridegroom families would be. In addition, the future bridegroom would present his future father-in-law with a piece of cloth, which symbolized engagement, because it was the first gift from the bridegroom to future parents-in-law after they had given their consent to the marriage. Cloth decorated the wedding procession as well.

The wedding costumes of the bridegroom and bride were also a part of the bride price and marriage portion, thus playing a social role together with fabrics. In contrast to everyday clothes, wedding dresses, being a symbol of the wedding ceremony, were specially made for this occasion, richly decorated and longer in length (Zykova, 1998: 30 – 31).

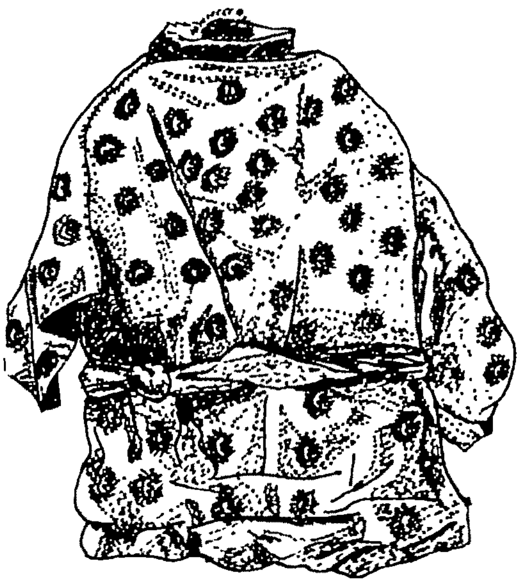

Fig. 1. Ittarma (after Sokolova (1990)).

However, the shawl (or, to be more precise, shawls) played the main role in the wedding ceremony. Following Golovnev, the wedding ceremony can be called the "shawl festival" (Golovnev, 1995: 286 – 287). The shawl also played a symbolic function. After the shawl was sent to the girl's parents, it served as a symbol of engagement, preventing other men from asking this girl for marriage. If the parents left the shawl, this meant that they did not object to the engagement (Kulemzin, Lukina, 1977: 201). The same refers to the case when a young man presented his bride and her mother with a shawl. The shawl was a necessary attribute of the father-in-law, who had a shawl on the tip of his walking stick. After this, the bride put this shawl onto her head. The bride and bridegroom would then sit together under a shawl–canopy, as guests waved another shawl above their heads (a symbol of future family happiness). Wrapping hands and covering the bride on the bed with a shawl, as if she were dead, was connected with the symbol of "dying" or "death" in this culture and the subsequent rebirth in another culture (Golovnev, 1995: 286 – 287). Shawls and other pieces of fabric were also used to decorate wedding processions, thus becoming a symbol of the wedding.

Note a very important tradition of the Ob Ugrians: a woman would cover her face with a shawl in the presence of her husband's elder relatives (avoidance). This tradition is based on a belief that a woman repudiates her father and her old world and transfers to the new world of her husband (Ibid.: 287). In addition, covering faces shows that a woman respected the elder person who has now become one of her relatives (Startsev, 1928: 76).

The burial rite

Let us note the main uses of textiles and woven clothes in the burial rite. The face of the deceased was covered with a piece of cloth and face features were specially marked on the cloth. Thus, the deceased lost its connection with this world (he could not see, smell, hear, speak, etc.), and the interface between these two worlds was symbolized by the cloth (Roslyakov, 1896: 3). In addition, this can be explained by an attempt of the living to protect themselves from the dead, who could take their souls, using cloth, a powerful talisman.

Cloth was used to cover the deceased in a coffin. It is difficult to explain the semantics of this tradition. Possibly, it is the same as in the previous case.

A doll depicting the deceased – *ittarma* (Fig. 1) – was also made of a piece of cloth. Because the *ittarma* was believed to contain the soul of this person, people always treated this doll with care (Zenko, 1997: 113; Kulemzin, 1984: 148) so that it eased the difficult transition and adaptation to the afterlife. The doll protected the living from the dead as well: when the deceased would "wake up" and discover that he was lying in a grave, he would come home, see himself as a doll, and go back to the grave (Karyalainen, 1994: 130). As the *ittarma* served as a container for the soul, it was fed, given something to drink, and put to bed. People also sewed special miniature clothes for this doll, which were similar to those worn by the deceased in real life.

Startsev (1928: 124) also reported that female *ittarma* wore patchwork clothes and male *ittarma* wore mainly garments of deer hides. Therefore, we can logically conclude that textiles were generally associated with the female nature, but this could also be a later tradition observed in the 1920s.

One entered the house of a dead person crossing a piece of burning cloth. This custom is related, on the one hand, to the purifying capability of fire and, on the other hand, to the protective function of textiles.

The deceased was dressed in woven clothes, as a rule, in his/her favorite costume or even several costumes, which marked his/her high material status. The clothes of the deceased were placed above the grave or into the coffin in order to supply him/her with personal belongings in the afterlife. Clothes were also hung out on trees or given to neighbors. People generally tended to dispose of the deceased clothes in order to prevent their souls from returning to their homes (Chernetsov, 1959: 145). Generally, people avoided keeping clothes, whose owners had just died, in their houses because these garments symbolized the dead people and, hence, were related to the other world. The Ob Ugrians believed that all ties on the clothes and shoes of the relatives of the dead must be undone, so that the deceased would take his afterlife easier (Karyalainen, 1994: 101 – 102). Thus, the relatives took care of the deceased and simultaneously protected themselves from him so that he/she would not be insulted and therefore cause any kind of harm or trouble.

An important element of the burial rite was the intentional impairment of the clothing: cutting out pieces, slitting, etc. Clothes were damaged because of the idea of the mirror-like nature of the world: what is damaged here will be normal in the afterworld. There are other possible reasons for intentional damaging of the clothes. For instance, the relatives "slashed" the clothing, to release his/her "soul" or, probably, in order to protect themselves from the dead: if the deceased became "alive" one day, he would see the signs on his clothes and understand that he had died; after that, he would start crying and go where all dead people must go (Ibid.: 77).

Let us discuss the ritual use of particular elements of the traditional costume, namely, shirts, trousers, gowns, belts, and shawls

The shirt and trousers worn by the deceased had at least several semantic meanings. They indicated (1) the sex and age of the deceased (female, male, and for kids), (2) his/her social (material) status (the more shirts he had, the richer he was), and (3) symbolic meaning (dressing the dead, relatives took care of the deceased and protected themselves from his intrusions). Damaged shirts and trousers symbolized the affiliation of the deceased to the other world.

The gown worn by the deceased had all the above-mentioned functions. The gown worn by the living on the other side was a sign of deep mourning.

The shawl was also widely used in the burial rite: it covered the face of the deceased, instead of a piece of cloth. The shawl, along with other personal belongings, was put into the coffin and above the grave, which was due to the ideas of care and protection. Shawls, hanging outside houses, indicated that some people died in these houses. The shawl was also a symbol of mourning. It was worn with its wrong side upward to prevent the dead from recognizing the owner and taking him to the other world (Sokolova, 1980: 141). Mourning shawls were black: the mourning garments of the Ob Ugrians, similarly to other peoples, were also black.

Both the deceased and his mournful relatives wore a belt: men wore unfastened belts during mourning or not at all. Thus, the living tried to disguise themselves from the dead. Normally, the Ob Ugrians wore belts, and, hence, it was difficult for the soul of the deceased to recognize his relative and cause him any harm. Moreover, unfastened belts, as well as undone ties on the clothes and shoes, served to protect the living. Similarly to other elements of the costume, belts were damaged to indicate the near end of one of close relatives.

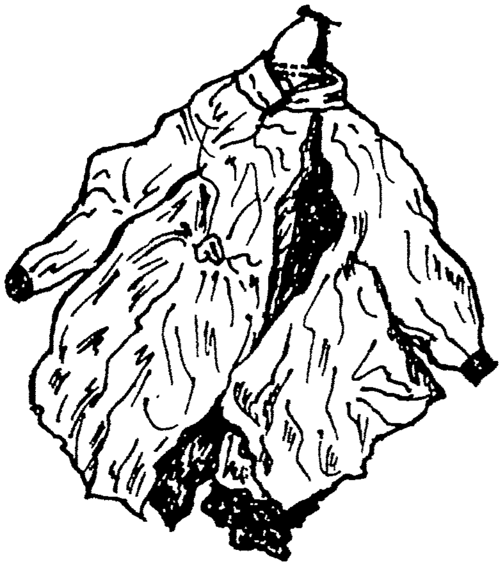

Fig. 2. Mir-susne-khum from a home sanctuary (after Gemuev and Baulo (1999))

In conclusion, we would like to analyze a custom observed by Startsev (1928: 127 – 128) that a fur coat could not be placed into the coffin. The fact that this tradition was noted only by this scholar probably suggests that other scholars and travelers simply did not pay attention to this tradition. However, this tradition is not enough to prove that only woven clothes were given to the deceased, but this can be taken as indirect evidence. A similar custom was observed among the Russian population of Siberia in the late 19th – early 20th centuries (Bardina, 1995: 195) In this case, a frequent use of woven clothes indicates its special role in the burial rite.

The sacrificial ceremony

The Ob Ugrians depicted their gods using textiles, making them look more "anthropomorphic": the core of a figurine, a wooden idol, an iron spear, or lead cast figurines, were wrapped in fabric, thus acquiring an anthropomorphic shape. The clothes for idols (Fig. 2) as well as the sacrificial costume were made of woven fabrics: shirts, gowns, kaftans, hats, and shawls. Textiles were used to wrap a sacrifice or as a separate kind of sacrifice, along with coins, knives, and animal hides, so that spirits helped a prayer. The most popular sacrifice among the Ugrians was a strip of clothing with a coin wrapped into one end (*arsyn*).

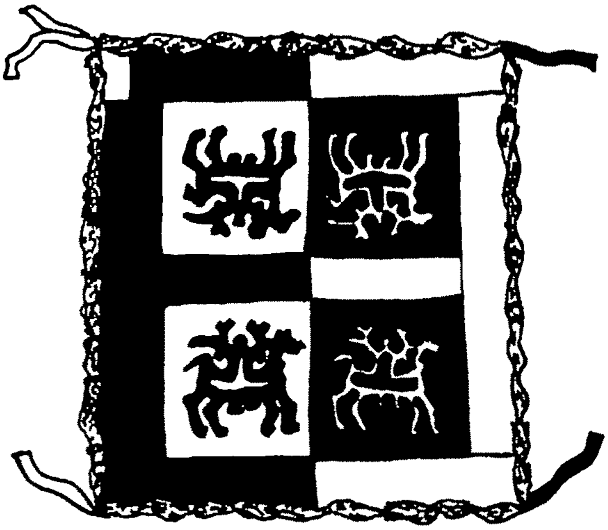

Fig. 3. Sacrificial blanket of Mansy (after Gemuev and Baulo (1999)).

Ugrian idols wore woven clothes (shirts, kaftans, gowns, shawls, etc.) which were a symbol of the anthropomorphic nature: empty sleeves symbolized arms crossed on the "stomach." As the Ob Ugrians believed, clothes made people what they were; without clothes, people became animals living in the wild world. For example, one of the legends tells us a story how a man turned into a bear after he took off his clothes. This legend indicates the importance of clothes, which were the elements of the man's humanistic nature. The bear takes off his hide and becomes man (Chuchelina, 1995: 85). Similarly, woven clothes imparted anthropomorphic characteristics to gods, tribal patronizing spirits, and epic heroes, so that they became comparable with human society (Glushkova, 1999: 175). In addition, idolistic figurines wrapped in shawls (or any other pieces of woven clothes) did not belong to the world any more, being transferred to another state of being (Tuchkova, 1994: 203).

At present, it is a well-established fact that the so-called "sacrificial blankets" played a special role in the sacrificial procedure of the Mansy and Khanty (Prytkova, 1949; Gemuev, 1990; Baulo, 1997; Gemuev, Baulo, 2001; Baulo, 2002, etc.). In the Mansy language, these blankets are called "clothes," which evidences their close affinity with sacrificial garments. The blankets were used to cover animals during the sacrificial ceremony. Other terms also corresponding to the blankets are "sacred," "holy," and the "saddle of the World Observer" (Gemuev, Baulo, 2001: 16).

Sacred blankets were made of several pieces of cloth sewn together and decorated with an appliqué of a mounted rider (Fig. 3). The rider's figurine depicted on the blankets is often compared to the image of Mir-susne-khum (World Observer), a chief patron of family. Therefore, the Ob Ugrians related directly the stability and health of all family members to the presence of the sacrificial blanket decorated with godlike images (Gemuev, 1990: 182). The belt and helmet of the Heaven Rider, which embodied Mir-susne-khum, were made of cloth in the same manner (Gemuev, Baulo, 2001: 12; Baulo, 2002: 66). In addition to the saddle, the "helmet" and "belt" were sanctified in numerous myths and legends: the belt of "seven geese" was put on Mir-susne-khum by his mother and the "sacred helmet of seven sides" (a helmet of seven pieces) was put on him by his father Torum (Gemuev, Baulo, 2001: 12). The attributes of the sacrificial procedure on occasion of sanctifying the sacrificial blanket (one or several blankets, a ritual silk gown, and a shawl), which covered the back of the sacrificial horse, meant that "... Mir-susne-khum bogatyr [hero] is riding a horse; he is sitting on a saddle-*yalpynga* dressed in a gown and has a shawl on his shoulders" (Ibid.: 18). Here we have a bright description of a symbolic function played by specially produced ritual articles. It is interesting to note that it is connected, on the one hand, with the house and family (culture) and, on the other hand, with the son of the Heaven God sent to the earth. Textiles and textile objects were symbols connecting Heaven and Nature to the younger son of Numi-Torum.

Thus, we might state that textiles and woven clothes were widely used in the cult practice and even distinguish their special roles.

Bear Festival

The Bear Festival held a significant place in the ideological system of the Ob Ugrians. Every element in the costumes of every character, which took part in this festival, had a special meaning. Even small details were significant ideologically, culturally, and historically (Fig. 4). Below, we discuss in detail the use of particular elements of the costumes.

The textiles used in the Bear Festival played the following roles: (1) to create the images of various animals, for example, an elk, thereby disguising the man's nature so that the bear would not recognize him; (2) to cover the faces of people who danced for the gods, making the god invisible to people; and finally (3) as sacrifices to the bear in order to propitiate it.

On the day of the festival, people wore only their best clothes; otherwise, they could have offended the bear. Thus, one of the bear songs describes how a sacred bear ate the child of a mother, who was dancing in poor clothes made of cedar and fur-tree bark during the festival in

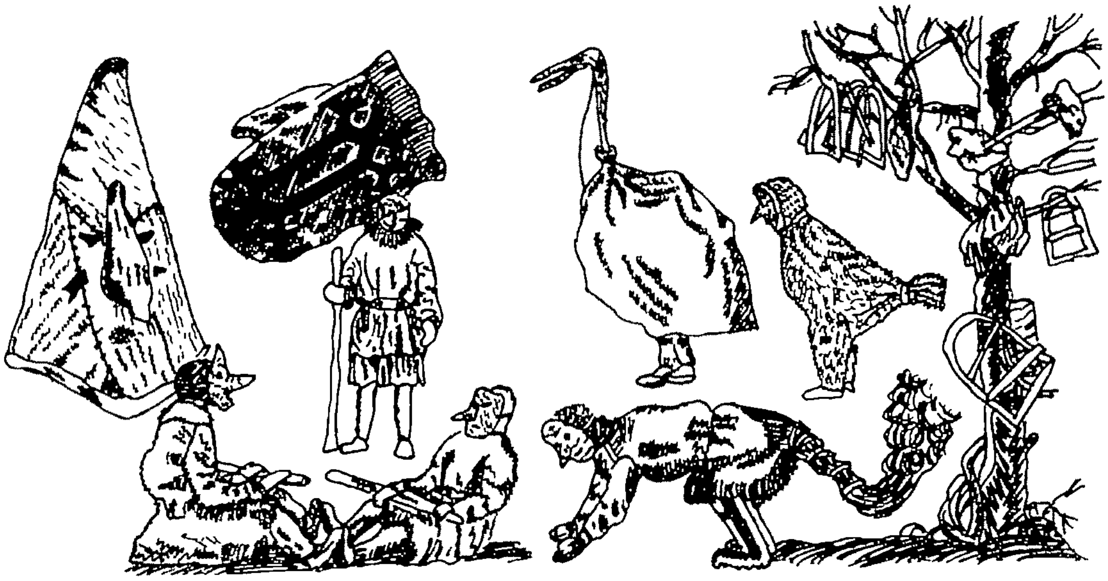

Fig 4. Attributes of the Bear Festival (after Sokolova (1976)).

honor of a killed animal. However, the bear spared a child lost in the forest and even tried to comfort him because the child's mother was dancing for him in her best dresses (Patkanov, 1999: 165). In addition, during this festival people often wore their dresses inside out so that the performer would be unrecognizable to the bear.

The shawl was also an important attribute of this festival. Women used to cover their faces with the shawl: according to the Ob Ugrian ideology, the bear was an ancestor, an old patron; therefore, women had to cover their faces, as if it were a relative of their husbands. Moreover, shawls were worn by men who played female roles in small performances because the shawl symbolized women. Along with plain pieces of fabrics, the shawl was used to imitate invisible gods or disguise the men dancing as animals. The shawl also decorated the head of the bear: worn on the head, symbolizing a female bear, and around the neck, imitating a male bear.

People also wore textile or cotton mittens because the bear should not see human hands.

Sacred silk gowns of various colors specific of every imitated god concealed the affiliation of the characters with the human society and a certain sex and age.

All participants of this festival were obliged to wear belts. A special red belt served as a symbol of gods.

The shirt and goose figurines made of fabric were also used to imitate particular animals, thus disguising the man.

One of the attributes of the Bear Festival was sacrificial blankets, which were often stored with other articles, such as gowns, hats, ritual sables, and "cranes." A sacrificial blanket with the image of seven riders thrown over the sable with its lining upward imitated a horse of Mir-sukne-khum, arriving to the Bear Festival. The giant ancestors were simulated by huge helmets with images of riders or other figures placed on high poles (Gemuev, Baulo, 2001: 18).

Colors also played an important role in this festival. The performers dancing for the gods wore white clothes (a symbol of luck, happiness, and prosperity) and black (sorrow, mourning, grief, and illness). The color of the costume of a certain god depended on the status of the latter: the spirit of illness or death Khin-iki was dressed in black, whereas all good gods, in white. Red played a special role as well. A red belt was a symbol of purification; before spiritual dances, the room was fumed. Red was also a symbol of fire. When people slightly burned a fox's tale, this was meant to purify the room from evil spirits (Kulemzin, 1983: 126 – 127).

Functions of textiles and textile clothes

Textiles and clothes exercised the following most significant functions in the life of the Ob Ugrians: utilitarian, social, sex and age, apotropaic (protective), and semiotic.

1. ***The utilitarian function*** means protection from environmental conditions. This is especially important for northern people who lived under severe climatic conditions. The function pertains not only to fur clothes, but also to woven clothes, which were the first "clothes" of a newborn baby.

2. ***The sex and age function*** demonstrated the difference between the male and female clothes and between the costumes for adults and children. The sex difference is indicated not only by the style and individual elements of the clothing, but also by the attitude towards the costume. Male clothes were considered sacred (especially the belt and shoes), whereas female garments were considered "abject" and men were ashamed to touch them (Golovnev, 1995: 284). Adult and children's clothing differed mainly in decoration. Children's clothes had richer decorations because they were thought to protect the child from evil spirits. Children's garments have preserved their traditional style and decorations over a long period of time.

3. ***The social (material) function*** was revealed in the wedding ceremony, burial rite, and sacrificial procedure. Clothes indicated the division between the rich and the poor. The former could afford richer apparels, more textiles, and richer marriage portion in this world, hence, more luxurious clothing and textiles in the other world and, more abundant sacrifices to the spirits.

4. ***The apotropaic (protective) function*** was also very important. Woven clothing was a very strong talisman, and its multipurpose use only enhanced its power. The apotropaic function is related to the weaving process. As it is known, in many Eurasian cultures, the thread, spun by rotating a spindle clockwise or counterclockwise, was endowed with a deep semiotic meaning. A shapeless tow consisting of separate fibers was formed into a homogeneous, strong thread by rotating (Boryak, 1989). In the myths of numerous ethnic groups, the thread was closely connected with the notions of fate and predestination.

Textiles can be produced by various types of weaves and knitting. The main idea of weaving was to create a uniform, ordered system of threads having a planar structure, more often semitransparent or opaque.

Textiles acquired the special apotropaic status of a talisman, which was widely known from the ethnography of Eurasian cultures, owing to several factors: (1) the initial threads being woven to produce a piece of cloth entered a new state and (2) all clothes were hand-made. This function of textile objects was enhanced by various types of decoration (embroidery, pattern weaving) depicting certain symbols (Glushkova, 1999: 231; Polosmak, Malakhov, 2000: 392). This ensured the special role of fabrics and woven clothes in the Ob Ugrian culture. This function was extremely important in the childbirth ritual, burial rite, and the Bear Festival: in the first case, the protection of a mother and a child from evil spirits; in the second case, the protection of the living from the dead; and in the third case, the protection of man from the animal (alien) world. The sacred blanket ensured family happiness.

5. **Semiotic function**, in which textiles and clothes act as a certain symbol bearing important information, clothes reflected the idea of the Ob Ugrians about the ternary structure of the Universe, about man, his states, and his soul (Golovnev, 1995, Kulemzin, Lukina, 1992). In each of the above-indicated rituals, textiles and clothes become symbols. For example, in the childbirth ritual, a doll made of fabrics imitated the Kaltashch-anki goddess (Isaeva, 1994); during weddings, the shawl was a symbol of engagement, marriage, the joining of a young married couple, and the transition from one culture to another (Golovnev, 1995); in the burial rite, a symbolic image of the deceased was a container for his soul made of fabrics and clothes (Karyalinen, 1994; Kulemzin, 1984, Zenko, 1997). During the sacrificial procedure, an idol made of fabrics wore special clothes, and a particular spirit was imitated using fabrics (clothes) (Karyalinen, 1994; Glushkova, 1999). During the Bear Festival, a combination of various types of clothes symbolized a certain participant of this festival (for example, a red belt and silk gowns symbolized gods) (Moldanov, 1999; Fedorova, 1994). Textiles and clothes were sacrificed to various spirits asked to provide help in delivery, hunting, and fishing, and to grant health and prosperity. Moreover, spirits were often thanked for help by presenting them with pieces of fabrics and clothing. In these cases, textiles and woven clothes served as a symbol of request or gratitude. Sacred blankets often accompanied the images of patronizing spirits or symbolized a Heaven Patron by themselves.

Thus, in the ritual practices of the Ob Ugrians, the textiles and woven fabrics were mainly used not for utilitarian purposes, but acted as a special symbol containing information.

Conclusions

Ritual practice is an important element of the Khanty and Mansy cultures, which have preserved their long-lasting traditions until the present day. This explains the reason for the importance of textiles and woven clothes in the Ob Ugrian rituals. In their everyday life, the Ob Ugrians were strongly influenced by the Russian culture, which led to changes in their own culture. However, the ideology, especially in the spiritual context, remained unchanged until the ethnographic present. The use of cloth in different spheres of life of the Khanty and Mansy indicates the ancient origin of this tradition.

As was noted, it is still believed that the Ob Ugrians first used fur rather than fabric and woven clothing because of a shortage in furry animals (Gemuev, Sagalaev, 1986: 146; Karyalainen, 1995: 59 – 60). Because animal pelts were the main sacrifice in various rituals, after their number decreased, textiles and textile clothes substituted them in the rituals. However, results of our study indicate that this question is far from solved.

All the rituals considered (childbirth, wedding, burial rite, sacrifice, and the Bear Festival) are traditional to this culture, and, hence, a frequent, meaningful use of textiles and clothes in these rituals suggests the ancient origin of this tradition, too.

Startsev reported that fur clothes were not placed into the coffin because the dead would have to count every single hair on this fur coat in the other life (Startsev, 1928: 127 – 128). We take this as probable evidence in favor of the more ancient use of textiles among the Khanty.

Sirelius noticed that textiles rather than fur were sacrificed (Severnaya kniga..., 1993: 101). As early as in the 18th century, Novitskiy noticed that fabrics (linens, cloths) were a frequent "bloodless" sacrifice (Puteshestviya..., 1999: 48 – 55). As it is known, Novitskiy's work is of special interest to ethnographers because it reflects the most ancient strata in the ideology of the Khanty.

Textiles and clothes were often used even by the Northern Khanty during the Bear Festivals, although they typically wore fur coats. In these rituals, woven clothes, which were not used in the everyday life of the northern hunters and are lacking in ethnographic collections, are of primary importance. Several necessary attributes, such as a textile belt or covering a face with a shawl indicate their ancient origin.

Silk that was used to sew sacred gowns was imported. Logically, this type of fabric, as the most valuable, must have been sacrificed first. However, this did not actually happen. Therefore, fabrics made of plant and wool fibers (including cotton) were more valuable for local people compared with silk because the former belonged to the traditional culture. Clothes of plant and wool fibers are the most widespread in the traditional culture. Pieces of clothing made of silk, such as gowns and shawls, were, as a rule, the attributes of gods and spirits.

The significant role of a shawl (made of fine fabrics) in all the rituals considered above implies that fabrics occupied an important place in the culture. In the sacrificial ceremony, the shawls could be substituted for fur, but in the wedding ceremony and during the Bear Festival, this substitution was hardly possible. Our assumptions are confirmed by folklore, a very ancient cultural phenomenon.

It is of interest to consider the wide use of fabrics (coarse cloth and silk) in the rituals connected with Mir-susne-khum. As it is widely known, the image of the Heaven Rider is closely connected with the Iranian mythological picture of the Universe (Toporov, 1981; Gemuev, 1990; etc.). One of the world centers of weaving appeared in the Middle East during ancient times and continued to function for quite a long time thereafter. Obviously, the sacred blankets of the Ob Ugrians made of cloth and decorated with riders can be compared with the textiles of the Scythian period from Gorny Altai (Gemuev, Baulo, 2001: 23). However, it is more correct to compare the blankets not with felt objects, but with rugs also decorated with the images of mounted riders. In both cases these are woven objects; on the Pazyryk articles, the decorative pattern was woven, and on the Ob Ugrian rugs, it was made in the appliqué technique. Taking into account that rugs that covered horses found in the Pazyryk kurgans are of Middle East origin (Rudenko, 1968), a certain affinity between the cultures of the Ugrians and Iranians is quite possible. In addition, this is another indirect proof of early textile production and use (Early Iron Age? Early Middle Ages?) in the culture of Mansy and Khanty ancestors. With time, these traditions obviously changed, sometimes degraded, as can be seen from the embroidery on Ob Ugrian nettle shirts and gowns (Glushkova, 1995: 48 – 50) or from the dominance of fur clothes among the Northern Khanty. However, the memory of traditional methods of textile production was preserved for a long period and was reflected in the embroidered figures that imitated traditional tapestry, in appliqué work, and a wide use of fabrics in rituals.

Thus, we proved that fabrics and woven clothes were typical not only of the ritual practices of the Ob Ugrians, but a part of their culture since very ancient times

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PHOTOETHNOGRAPHY

THE TELENGIT POPULATION OF THE ALTAI REPUBLIC: COMMENTS ON THE PHOTO PORTRAIT

"In this remote region it is worth standing quiet for a moment to feel lost in this realm of primeval quietness, near the ancient burial mounds. Here, one finds oneself far away from modern world and close to roots of civilization. One becomes able to feel Time passing by..." This citation is a typical introduction to a traveler's report about a trip in the southernmost part of the Russian Altai along the intermountain valleys of the Ulagan and Kosh-Agach local administrative regions of the Altai Republic.

"For forty years, thousands of defenseless people have been living in the Sayan-Altai Region as hostages of scientific-technical progress. The situation in the southern Altai can be defined as a small chemical war..." This is a typical opening for newspaper reports about the landing of disjoined space ship sections and discarding space ship fuel on the territory of the Altai Mountains. Another popular topic of newspaper articles is the life of the Telengit population of the southern frontier region of Russia. The Telengits represent one of the indigenous peoples of the Russian Federation. The status of the Telengit population as an indigenous minority was not recognized until the year 2000. The everyday life, religious behavior, and traditional feasts of the Telengit people at the threshold of the third millennium were the focus of the members of an International Photo-Expedition "People at Frontiers." This Photo-Expedition took place in Siberia in June 2002. It was a joint project of the "Open Society" Institute (Novosibirsk, Andrey Shapovalov), the Yuri Kondratiuk Foundation (Novosibirsk, Valery Klamm), "Objective reality" Foundation/Photographer.Ru (Moscow, Liza Factor), and the Institute of Archaeology and Ethnography, SB RAS, (Novosibirsk, Irina Oktyabrskaya). Photo-investigations in the current ethnic-political situation in South Siberia, including the Altai Republic has been included in the list of major goals of the expedition.

The Altai Republic was proclaimed an autonomous subject of the Russian Federation in 1991, instead of the former Gorny Altai Autonomous Region. The basic documents of the new republic declared that the organization was a national state in accord with the right of the peoples populating the Republic for self-determination and their will for social and cultural progress, and cultural and spiritual reconnaissance. Laws on historical-cultural heritage and languages warrant sovereignty of the languages and cultures existing in the Altai Republic.

In 1989, the total population of the Altai Republic was 190.8 thousand people, including representatives of various ethnic backgrounds: 115.2 thousand Russians, 59.1 thousand Altai peoples, 10.6 thousand Kazakhs, 1.7 thousand Ukrainians, 0.83 thousand Germans, 0.39 thousand Tatars, and 0.37 Belorussians. In the early 1990s, the proportion of the Altai population was only around 30% of the total. The Altaians represent the predominant population only in the remote regions of the Republic, such as the Ulagan and Kosh-Agash administrative regions.

The politics of placing a priority on ethnic values, primarily of the Altai people, in all spheres of social life impacts the establishment of the state system of the new republic. However, attempts to regard the Altai people as a single nation with a common language, culture, and religion have met counteractions within the population. The Altai Republic has been faced with the problem of ethnic sub-groups. Various academic classifications have traditionally distinguished two ethnic groups in the Altai ethnicity: the southern ethnic group includes the Teleuts, the Telengits, and the Altai-kizhi; the northern group comprises the Tubalars, the Chelkans, and the Kumandins. These ethnic sub-groups have not only different ethnic and cultural heritages, but also differences in language, religion, and in their traditional systems of land management.

From 1926 until recently, such ethnic affiliations as the Telengit, the Teleut, the Kumandin, the Chelkan, and the Tubalar were not registered in population censuses, all these people were recorded as the "Altai people." Then, in the late 1980s, representatives of the Tubalars, the Chelkans, and the Kumandins raised the question of the ethnic originality of these peoples.

Since the 1990s, the Basics of the Law of the Russian Federation on the rights of indigenous peoples have been publicly discussed. Those indigenous peoples who live within the regions of their traditional occupation, maintaining their traditional way of life, and identifying themselves as original ethnic groups not exceeding 50 thousand people, have been given the legal status of indigenous populations. The draft list of indigenous people of South Siberia has included the Chulym people, the Shorians, the Tofalars, the Tubalars, the Kumandins, the Clekans, and the Teleuts. According to the Act of the Counsel of Nationalities of the Parliament of the Russian Federation of February 24, 1993, the Shorians, the Kumandins, and the Teleuts were proclaimed indigenous peoples of South Siberia possessing relevant privileges similar to those that had been given to the indigenous minorities of the North. Such measures were taken to provide urgent and extraordinary help for the crisis-ridden minority populations. Establishing priorities on the indigenous people in social and juridical spheres has led to the active initiation of national movements in Siberian regions.

In 1992, the Association of the North Altaians was established in the Altai Republic. Restoration of traditional culture and recognition of the North Altai language dialects as official languages were among the major goals of this Association.

In 1995, the population of the Kosh-Agach and Ulagan Regions established an Association of the South Altai peoples "The Telengit" aimed at the promotion of the cultural-historical, and economic reconnaissance of the tribes and clans populating frontier regions. Such social processes reflect aspirations of the civic society of the Altai Republic to find an optimal form of co-existence between different ethnic sub-groups. However, at the same time, they contradict the theory and practice of consolidation of the Altai nation. The policy of ethnic self-identification has sparked an interest in original cultures of the Altai ethnic sub-groups in the academic community and artistic public circles. Ethnologists, political scientists, and journalists have begun various studies of the Telengit ethnicity. The sustained ethnic self-consciousness of these people and their adherence to traditions in everyday life and religion have become the core of various investigations, and topics about the ethnic and cultural ancestry of these peoples have become the themes of an array of academic research.

Historically, the Telengits are the descendants of the Ancient Turkic tribe Tele/Dolange, a name recorded in the Chinese chronicles of the 5th – 6th centuries AD. The Telengit population, self-named, seems to have been established as early as in the 14th century. It is generally believed that until the 17th century there was a common Telengit (Teleut-Telengit) ethnic union occupying the entire territory of the southern Altai. At the threshold of the 17th century, a compact Teleut ethnic group identified itself within the macro-community under the impact of inner and outer factors. This ethnic group migrated from the southernmost Altai to the Upper Ob basin and adapted to the new environment. During the 17th – 18th centuries they formed a separate nation. During the same period, the West Mongolian tribes of Jungar migrated into the mountain regions of the Altai, which in fact stipulated the collapse of the Teleut-Telengit ethnic union. The influence of the Jungar culture on the population of the southwestern and central regions of the Altai Mountains resulted in the formation of the Altai-kizhi ethnic group, which has been currently considered a title national group of the Altai Republic.

However, in the southeastern and southern regions of the Altai, in the basins of the Chuya, the Ulagan, and the Chulyshman Rivers, the Telengit ethnic group was formed, preserving the basics of its ethnic-cultural heritage*. A sub-group of the Teles is identified within the Telengit ethnic group. This sub-group is regarded as a separate national union, which was assimilated by the Telengit nation in the early 20th century, or as a separate clan or a union of clans within the Telengit nation. A hypothesis on the emergence of the Teles people has been put forward with respect to the issues of the social and cultural origin of the Altai Telengit population. Formerly, the term "telis" designated one of the wings of the frame of troop organization, which at the same time served as a pattern of civil relationships, the so-called military-administrative system of "telis/ tardush" that was created by the Turks in the 6th – 7th centuries according to the Hunnu model. Military leaders of the left and right wings of this frame were given the titles of the western *tardush shad* and eastern *telis shad* leaders.

The name Teles may be regarded as a remnant of such a system. During the 16th – 19th centuries the Teles were considered a noble family clan of the Telengit community. Yamaeva** quoted patriarchs of the Altai, connoisseurs of traditions: "The Teles is a noble family. They would not sit at the threshold of another people's home, especially at the threshold of "low-rank people." They could not marry the off-springs of "low-rank families." If they start a business, they carry it through; if they start a military raid, they do not stop it halfway because of any prejudices; if they conclude an agreement, they observe it until the end of its term. There is a saying: "A Teles (in his lifetime) would never give up his honorary position and his grave after his death." Traditionally, the Teles were regarded as defenders of their homeland, graves of the ancestors, and power. By the beginning of the 20th century, the Teles were assimilated by the Telengit ethnic community and became one of the family clans of this community.

The history of ethnic communities of the frontier regions of Gorny (Mountain) Altai of the 18th – 19th century is connected with the collapse of the Jungar Khandom. The defeat of the Jungar Khandom by the Tsin Dynasty of China forced the *zaisans*, clan leaders of the Altai, to bring their tribes under Russian jurisdiction. As a result, the Telengits had to pay double duties: to Russia and to China, until the mid-19th century

In the 19th – the beginning of the 20th century, the Telengits attracted public attention due to administrative reforms and complex ethnic-political and migration processes that occurred in the frontier Altai regions. According to the population census of 1897, the population of the Chuya basin (the Chuya Administrative Regions 1 and 2) included 4,899 Telengits and Teles forming 15 family clans*. In the second part of the 19th century, the Telengit elders gave their permission to the Kazakhs who migrated into the Altai from the Irtysh River basin in West Siberia as well as from Mongolia and China to pasture their living stock in the meadows of Chuia basin. This situation led to interethnic conflicts. In 1912 – 1913, a Land Commission established land allotments of different ethnic groups. However, the tense interethnic atmosphere has been preserved since the military conflicts between the Kazakh and the Altai populations of the 18th century.

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* **Sherstova L.I. 1999**. Etnopoliticheskaya istoria tiurkov Yuzhnoi Sibiri v XVII – XIX vekakh Tomsk. Izd. Tomsk. Gos. Ped. Instit., pp 65 – 75

** **Yamaeva E.E. 2002**. Rodovye prozvisha telesov (k probleme rekonstruktsii voenno-administrativnoi sistemy "telis/ tardush") In *Drevnosti Altaya*. Gorno-Altaisk· Izd. Gorno-Altaisk. Gos. Univ , pp. 136 – 142.

The Kazakhs represent a population competing with the Telengits (Altai people). For dozens of years, the number of the Kazakh population grew. In 1989, nine thousand people of the Kazakh ethnic background populated the Kosh-Agach Administration Region, which constituted 54.4% of the total population of the region, while the proportion of the Telengit population was only 39.6%. In the post-Soviet period, with the formation of the independent Kazakhstan state, the process of out-migration of the Kazakh population from the Altai began. Thus, in 1991, 8,200 Kazakhs and 7,013 Telengits lived in the Kosh-Agach Region, while in 1993 the numbers were 6,377 and 7,264 respectively.

In the early 1990s, a process of restoration of traditional institutions of local authorities began in the Altai. In February 1995, a meeting of all the citizens of the Mukhor-Tarkhata village of the Kosh-Agach Region in the Altai Republic (predominantly Telengitian population) established a position of *zaisan*, the elder of each clan *söök* existing in the village (clans of the Kypchak, the Tolos, the Tonjan, the Mool, the Sagal, the Todosh, and the Irkit). V.P Kokoshev was elected the elder *zaisan* of the Ulagan Telengit population. S. Ochurdiapov, a descendant of Ochurdiap *zaisan*, who was among those Altaian elders who first negotiated with the Kazakhs in the Chuya steppe, was elected the elder of the Telengits of Kokoria. In 1997, a tendency to integrate the *zaisan* institute into political processes was formed. More than ten candidates for the President of the Altai Republic, the majority of them being representatives of indigenous people, were nominated by the family clans in the election campaign of 1997.

The institute of clans has played an important role in the life of indigenous peoples of the Altai. Clans serve as a basis of ethnic self-organization. Inter-clan relations form an integral part of family and marriage links. The socialization of an individual also takes place within a clan framework. Diakonova traced eighteen Telengit family clans *sööks* in the Ulagan and Kosh-Agach Regions in the late 1980s**. The most numerous clans have the names of Kobok, Sagal, Kypchak, Mool, Teles, Irkit, and Yabak.

The Teles occupy a special position in the clan hierarchy of the Telengit community. They maintain family relations with the *sööks* Almat, Djeti tasy, Orgonchy, Ak-kobok, Kara-kobok, Yabak, Chagat, Yaryk, and Shakshylyk. All these clans can be identified as the Teles.

Representatives of the Kobok clan live in all the villages of the Kosh-Agach and Ulagan Regions. Records of the year 2000 have shown the following numbers of the Kobok population in certain villages: 517 people (129 nuclear families) in Kokoria; 310 individuals in Beltir; 98 individuals in Ortolyk; 157 individuals in Mukhor-Tarkhata; 138 individuals in Telengit-Sortogoi; 43 individuals in Chagan-Oozyn; 163 individuals in Kurai; and 68 individuals in Djazator. Sanctuaries of the Kobok clan are located in the vicinity of the Kokoria village.

The majority of members of the Sagal clan live in Ulagan and Kosh-Agach villages. This clan is believed to have been originated from the Ulagan Region. A mount near the Kara-Kudiur village on the bank of the Bashkaus River is regarded a clan sanctuary. A rock monument has been constructed there. In 2000, 543 members of the Sagal clan lived in the Kokoria village; 133 individuals lived in Beltir, 123 members of the clan lived in Mukhor-Tarkhata, and 115 Sagals lived in Kurai.

The Kypchak clan representatives of the Telengit tribe live in Beltir (325 people), 246 individuals live in Mukhor-Tarkhata, 177 members of this clan live in Ortolyk, and 112 people live in Chagan-Uzun. Oral narratives suggest that this clan originated in the western Altai, in the territories currently included into the Ongudai and Shebalinski Regions.

Such *sööks* as Todosh, Mundus, Maiman, Orgonchy, and Djeti Tastar are among the least numerous clans in the Telengit community*.

The overall number of the Telengit people currently populating Gorny Altai can be roughly estimated through official population statistics data: in 2001 the total population of the Ulagan Region, inhabited mostly by the Telengits, was equal to 12.4 thousand people. In the Kosh-Agach Region, where the Kazakhs constitute 50% of the population, the total population reached 17 thousand people. The Telengit ethnic community is one of the most numerous ethnic communities in the Altai Republic. Their culture and way of living are based on extensive cattle-breeding and preserve many traditional elements that have been forgotten elsewhere. The Telengits carry out traditional wedding and funeral rituals. Patrons of natural elements, masters of mountains, taiga, and springs, family and clan ghost-protectors constitute an integral part of their religious system. Hereditary shamanism preserves its significance as an element of the Telengit society. The manufacturing of shaman items is still a traditional handicraft as well. However, there is a notable co-existence of shamanism and other world religions: Islamism, Buddhism, and Orthodox Christianity. Together, all these religions represent a characteristic feature of this frontier region.

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* **Diakonova V.P. 2001**. Altaitsy. Gorno-Altaisk. Uch-Sumer, p. 5.

** **Diakonova V.P. 2001**. Altaitsy. Gorno-Altaisk: Uch-Sumer, p. 6.

* **Bidinov K.A., Maikhiev V.K., Yaitynov T.T. 2000** Erdjinelu Ere-Chui. Gorno-Altaisk: Uch-Sumer, pp 9 – 12

Islamism was inserted in the southern regions of the Altai in the late 19th century. In the late 20th century, several mosques were constructed in some Kazakh villages in the Kosh-Agach Region. Some representatives of indigenous populations have also turned into Islam. Closeness of the Altai to Tuva and Mongolia and historical-cultural links in the frontier regions have stipulated the impact of Buddhism/ Lamaism on the ideology of the local population. Its influence increased in the late 19th – early 20th centuries. Recently, several finds of items related to Buddhist cults have been reported from the mountain valleys in the Ulagan and Kosh-Agach Regions. A bronze figurine of "White Tara" represents one of the most significant finds. Currently, it is preserved in Telengit-Sortogoi. The owners of this figurine dream about establishing a "Center of White Tara."

Since the 1980s, the Orthodox Christian Church has been restored in the Telengit community, mostly in the Ulagan Region of the Altai Republic. In the early 20th century, a number of Orthodox Christian churches worked in such villages of the Kosh-Agach and Ulagan Regions as Chibit, Ulagan, Bashkaus, Chulyshman, Chodro, Kosh-Agach, Kara-Kem, and Balyktyiul. The Altai Christian Mission established as early as in 1830 treated this frontier region as one of the priority zones of interest. In 1861 – 1864, the Chulyshman Christian monastery was built; its history has been an important part of the history of this micro-region. Given all the contradictions of the Proselytism, Orthodox Christianity produced a profound impact on the Telengit community, which should be regarded as one of the major factors leading to its relative isolation among other ethnic communities in the Altai.

In the post-Soviet period, the process of restoring Orthodox Christianity in the indigenous population of the Altai was lead by Father Makary. Father Makary is a baptized Telengit, who became a monk. His family secretly practiced Orthodox Christianity for many years. Father Makary assists the process of national reconnaissance of his compatriots through popularization of ideas of Christianity. Over the last two decades, two Christian churches have been constructed in the Telengitian villages of the Ulagan Region.

Since the 1990s, the trend towards isolated spiritual and social development of ethnic communities within a multiethnic population of the Altai has been noted. The self-identification of people of different ethnic ancestries has lead to gaining special attention from the Government of the Republic to the problems of frontier regions. In 1994 and 1996, the Russian Government reached a decision on the priority measures supporting the social-economic development of the Kosh-Agach and the Ulagan Regions. According to these decisions, a quoting system of exploitation of resources of this micro-region has been established together with a system of urgent measures in the spheres of housing and industrial construction, education, and health care. Investigations on the consequences of environment pollution due to space ship fuel combustion over this territory have also been carried out.

Changes in the Russian national policy and adoption of new laws stipulate the growth of national self-identification processes. The Federal Law on the guarantees of the rights of the indigenous peoples in the Russian Federation was adopted on April 16, 1999 in full accord with the Constitution of the Russian Federation, the principles and norms of international law, and the international treaties of the Russian Federation. Within the framework of this law, a List of Indigenous Peoples Populating the Russian Federation was elaborated and adopted on March 24, 2000. The laws of the late 1990s – early 2000s have established the legal status of the Tubalar, Chelkan, Kumandin, Teleut, and Telengit populations as indigenous peoples of Russia and provided these nations with a chance to preserve their ethnic originality.

However, this process aimed at the restoration of historical justice has led to a situation of international tension, which became aggravated on the eve of the population census of the year 2002.

National leaders worried that a new legal status of indigenous peoples of the Altai Republic (the Chelkans, the Kumandins, the Tubalars, and the Telengits) would impact the political status of the region as a whole. The *Novoe Vremia* (New Times) magazine published a paper by Vladimir Tashtamyshev in September, 2002. Here he commented on the pre-census situation in the Altai Republic: "I would like to draw public attention to the situation in my homeland, the Altai Republic. Formerly, my country was populated by a single nation, the Altai people; the total population was about 85 thousand people. A year ago, the population was subdivided into *sööks* (clans) of the Tubalar, the Kumandins, the Chelkans, the Telengits, and the Teleuts, which began to be considered minorities and were included into the List of Indigenous Peoples of Siberia. Apparently, the total number of people in a clan does not exceed 50 thousand people. On the other hand, now law-makers in Moscow have a solid base for the liquidation of the Republic itself."

On the eve of the census, public opinion on the position of the Altai Republic treated the situation as "political order" and forecasted an inevitable annexation of the Altai Republic by the Altai Region of the Russian Federation. The Minister of Nationalities came to Gorno-Altaisk, the capital of the Republic, in order to reassure the people. The census was executed in October 2002. The Republic still exists and demonstrates economic and social development. However, the problem of indigenous peoples and their position in the current and future polyethnic community of the Altai and Siberia as a whole has not yet been resolved.

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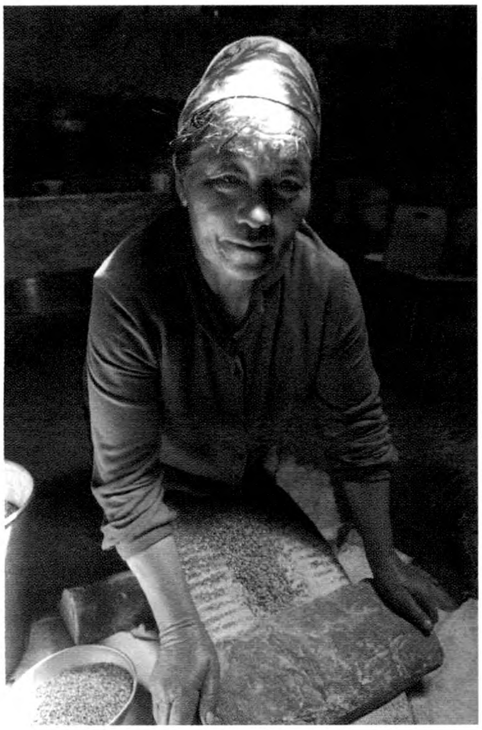
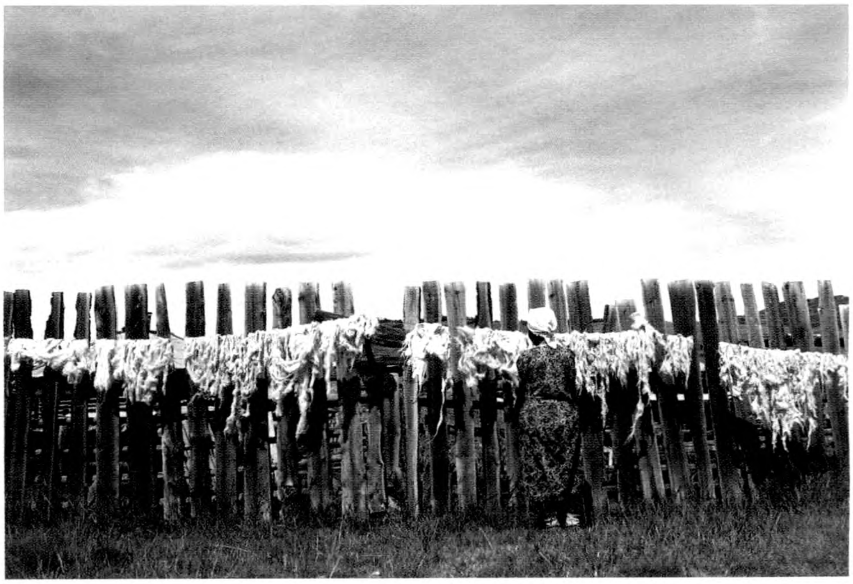


1. Aleksander Sorin. Tolkan manufacturing with the help of a stone grinding device *paspakh*
Balyktyiul, the Ulagan Region, the Altai Republic.

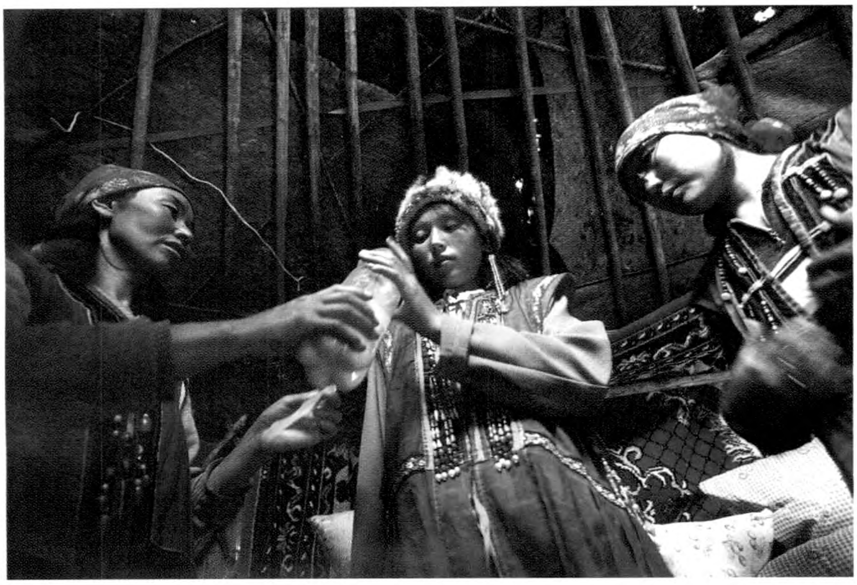
The small Altai lives according to the standards of a big world. People are in a hurry. A bus connecting Ulagan with Gorno-Altaisk is going along the Chuya road. The bus has passed by such stations as Aktash, Chibit, and Iodro. Passengers are coming in and out. A typical conversation on the Altai roads: "Where have you been?' – "I have visited my mother to make tolkan..."

Tolkan is barley flour, a component of a traditional Altai tea. In order to make a good tolkan, it is necessary to roast barley grain in a cast-iron cauldron, to peel it in wooden mortar, and to grind the grain in the stone grinder. The surrounding world is changing, but stone grinders still exist. The simplest and most important things are preserved: mother, home, fire, and tolkan. This is the basis of cultural heritage.

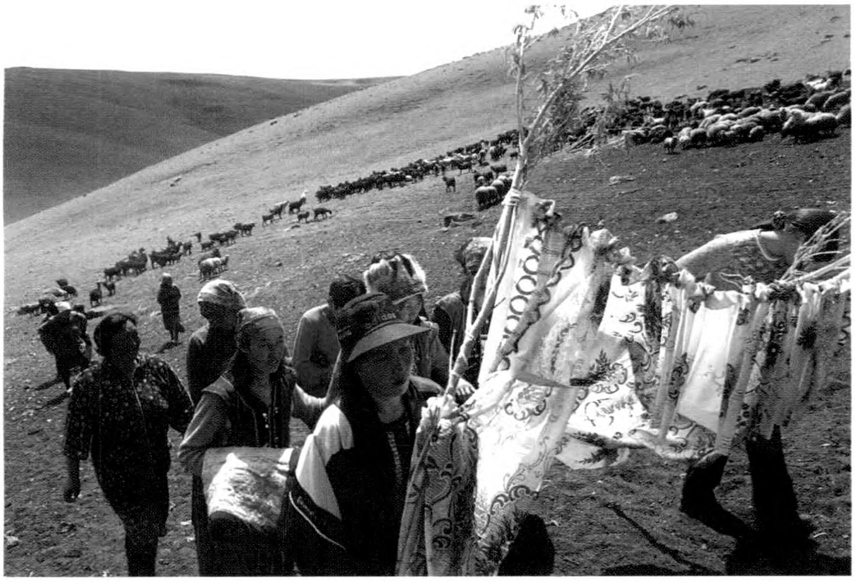


2. Aleksander Sorin. Wool washing
Balyktyiul, the Ulagan Region, the Altai Republic.

June is the time when the Attai people begin to wash wool. Clouds of raw sheep wool can be seen in all the yards. Locks of wool are flying up whipped with twigs. Women look intently at woolen locks: the appearance of a knot forecasts pregnancy. Clean wool is stowed and rolled to make felt, the warm happiness of an Altai house.



3. Aleksander Sorin. A Telengitian wedding ceremony.
"Treating" fire with milk in the yurt of the newly married couple
Chagan-Burgazy summer station, the Kosh-Agach Region, the Altai Republic.



4. Aleksander Sorin. Approaching mother-in-law's place
Chagan-Burgazy summer station, the Kosh-Agach Region, the Altai Republic.

A wedding ceremony was carried out at the shepherds' summer station Chagan-Burgazy in mid-June. This love story is a typical one for these people. A man, native of the Telengit-Sortogoi village returned home after having served in the army and met a girl at the wedding feast of his close friend. He "stole" the girl in the same evening and brought her to his parents' summer station. The parents forgave him, as always.

Upon reconciliation, matchmaking ceremonies and exchanging gifts took place as the wedding day was settled. A separate yurt of felt was then constructed for the young couple. A special folding screen (kozhogo), a symbol and amulet of a young family, was made for the bride. In the vicinity of the yurt, a young tree talnik was established marking a place where the matchmakers would meet. Celebrations began with the rituals of obtaining the dowry and making the wedding bed.

Later, the young bride was brought to this yurt, dressed in the wedding attire chegedek; her hair was braided into two plaits. The fire in the yurt was treated with milk, a symbol of life and home in the Telengit tradition, which ritual makes the young girl a mistress of the house and the keeper of the fire. After that, the whole procession moved to the mother-in-law station.

5. Aleksander Sorin. Mother-in-law's brother – the most esteemed guest at the Telengit wedding ceremony
Chagan-Burgazy summer station, Kosh-Agach Region, the Altai Republic.

6. Aleksander Kobylko. Just Married
Chagan-Burgazy summer station, Kosh-Agach Region, the Altai Republic.

Guests and relatives see the bride to the yurt of her parents-in law. According to the custom, her face should be hidden from her new relatives. The folding screen separates the girl from her new life. At the entrance of the yurt, she is fumed with juniper smoke as a foreigner, and treated with airak. Efficient women matchmakers decorate portraits of deceased relatives with a piece of white fabric and bottles of vodka are put on the table as a sign of respect to the bridegroom's clan. Then, the bride and the bridegroom pour a cup of fat into the fire so that the bright and high fire warrants long life for them. Upon introducing the bride to the home fire, tai, the uncle-in-law draws the curtain of the folding screen aside with the help of a lash, and a new daughter-in-law has been adopted into the family of her betrothed.

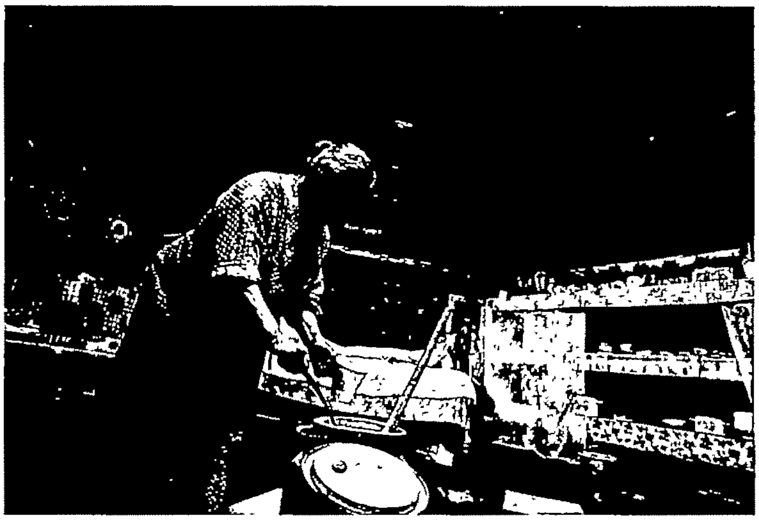
It is an ordinary and modest wedding ceremony, without any special celebrations. Only close relatives participate, but all the required rituals are carried out. Traditions are still esteemed in the Chuya steppe.

7. Vladimir Dubrovski. A family from the Koo village
Ulagan Region, the Altai Republic.

8. Aleksander Kuznetsov. Parishioners of the Trinity Church
Koo, Ulagan Region, the Altai Republic.

The Ulagan Region is populated by baptized Telengits Father Makary, a Telengit, initiated reconstruction of the St. Pantaleon the Healer Church in Balyktyiul in the 1990s. Also, the Trinity Church was constructed in Koo, a small village with several dozens of households One of the families sold their house in order to get money for building the church.

On the day of the arrival of the expedition to Koo, the local community carried out a religious procession against the drought. A service was then executed in the church. We asked for permission to shoot the service. Father Makary was not against the cameraman's presence, but the parishioners did not allow idle people to come. "We have come to speak to God, you know. ."

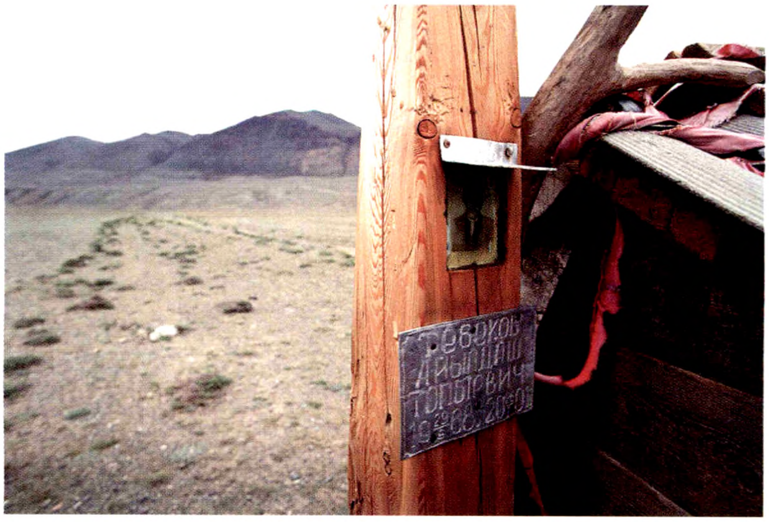


9. Aleksander Kuznetsov. *Airak* for a guest
Balyktyiul, Ulagan Region, the Altai Republic.

In the Ulagan Region, people used to build traditional polygonal houses in the yards near rather big and comfortable houses similar to those of the Russian peasantry. These small summer houses are called ails They are built in observance of traditions· separate activity areas for men and women and a special place of honor near the fire, where women are not allowed. Such ails represent a clear and habitual place for the local people. The fireplace is located in the center of the ail, fire is usually not extinguished. People still use old tripods holding cauldrons over the fire and preserve such things as family relics There, an aluminum, formerly wooden, tank for airak, a drink of sour milk, is placed next to the fire Milk has always been, and still is, a sacred thing for nomads Nowadays, when a guest enters a home, he is treated with a cup of airak as a sign of respect in many Telengit houses in the Ulagan Region.

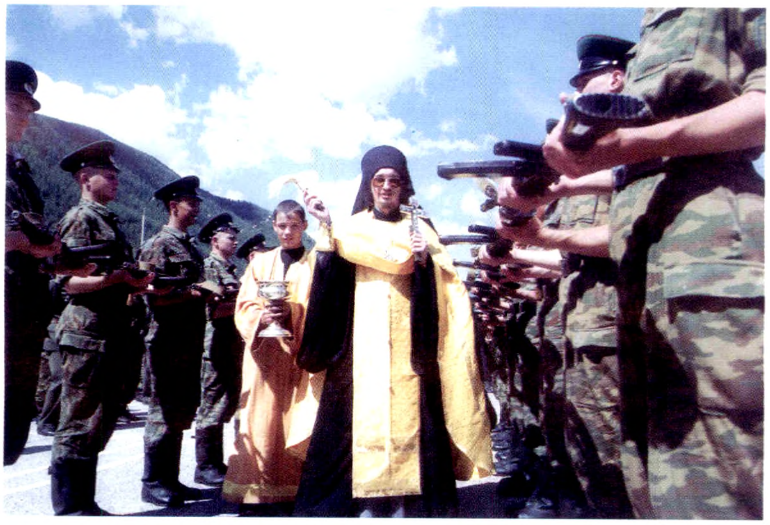
10. Andrey Kobylko. The past
Yazula, Ulagan Region, the Altai Republic.

Cultural heritage is not a simple thing. When I find myself in old Telengit ail-houses with leather saddlebags standing along the walls, where photo-pictures of relatives and former political leaders are hanging, I recollect the words of Andrey Tadyshev, a descendant of a zaisan "Reality comes from all sides and passes through my ail." These words were uttered while the speaker tried to get the light for smoking from a fire in his ail in Balyktyiul.



11. Aleksander Kuznetsov. A grave of the Telengit shaman Aildash.

A solitary grave has appeared in one of the remote parts of the Chuya steppe. Aildash, a shaman, hung himself in 2001. Ghosts tormented him to death. His destiny was to begin his shaman practice when he was twenty, and finish it when he was forty. He was a disciple of one of the oldest shamans in the Chuya steppe, Ariman Borisov. He instructed Aildash how to make a shaman's costume, and a shaman standard, a substitute of a tambourine, and showed him the ways to the other world. Aildash healed people during the periods of the new moon. However, during the periods of the old moon, he stayed alone with ghosts and got drunk because he was afraid. Aildash died when he was 33, but his daughter inherited his gift. Recently, she has started schooling. They say, that her destiny is to become a shaman at the age of 16.



12. Vladimir Dubrovski. Trinity Day
Aktash, Ulagan Region, the Altai Republic.

Trinity Day in the summer 2002 coincided with the day when solders of the Aktash frontier detachment took their oath. Father Varlaam (Dmitry Yakunin), a Doctor of Theology and a vicar at the Church of St. George the Victorious in the Aktash village, blessed the solders. He was born in Snezhinsk, a research center of nuclear physics in the Urals. He graduated from the Medical University in Cheliabinsk and served as a physician in the army. In 1996, he took monastic vows and was blessed to build a church in the Altai. He built a parish church in Aktash and consecrated the St. Eugene the Martyr chapel in the Aktash frontier detachment in 2002. Father Varlaam renews the practice of Russian Orthodox Christian mission activity in the frontier regions of the Altai. He executes services in Church Slavonic, Altai, Greek, and Latin languages in the parish church in Aktash, populated by Russians, Kazakhs, Altaians, Telengits, and representatives of other nations as well. On Easter, he reads the Gospel in English because he believes that a prayer pronounced in various languages is a sermon to the World.

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ANDRONOV POPULATIONS OF WEST SIBERIA: CRANIAL DATA

Introduction

Steppe and forest-steppe regions of West Siberia, from the right bank of the Irtysh River through the Yenisei River, were populated by people of the Fedorov Culture. The Fedorov people appeared in this region no earlier than 1300 BC, partly displaced and partly interbred with the Samus and Krotov tribes (Kosarev, 1981; Matyushchenko, 1973a, b; Molodin, 1985; Molodin, Glushkov, 1989). Most writers date the Fedorov sites to the 15th – 12th centuries BC. They are concentrated in the area southeast of the Urals (between the Miassa and the Uya, and in the Middle Tobol basin), in Kazakhstan, and in the Upper Ob River basin, corresponding to the steppe of the West Siberian Plain north of the Altai mountains. This is a region which, in archaeological scholarship, is sometimes incorrectly referred to as "Altai" or "steppe Altai". Both terms, however, are commonly associated with Gorny Altai, where Fedorov sites have not been identified. Also, they are present in the Baraba forest-steppe between the Ob and the Irtysh rivers, in the Tomsk area, in northern forest-steppe basins of the Altai-Sayan highlands (Kuznetsk and Minusinsk), in the Tien Shan (including part of Xinjiang), and in western Central Asia, between the Amu-Darya and the Syr-Darya rivers.

While there is no doubt that the Fedorov Culture entered West Siberia from afar, the source of migration is a matter of dispute. Certain early hypotheses are evidently outdated. These include ideas, based on materials from the Minusinsk Basin, that the Fedorov Culture was the result of a mixture between the Afanasyev people and the Eneolithic populations of Kazakhstan (Formozov, 1951), or that it was associated with Neolithic and Eneolithic Ugrian-speaking tribes inhabiting the eastern Urals, northern Kazakhstan, and West Siberia (Salnikov, 1967). At present, the range of views concerning the origins of the Fedorov Culture is quite considerable. Kosarev (1981) looks for its roots in the Combed Ware Culture of the eastern Uralian forest zone, while Kuzmina (1994) relates Fedorov ceramics to the Eneolithic tradition of Central Kazakhstan. According to Potemkina (1985), the Fedorov people descended from the Eneolithic tribes of the forest-steppe and southern taiga zones of the Urals and adjoining areas of the West Siberian Plain. Grigoryev (2000) finds certain "proto-Fedorov" elements in the Near East, etc.

Physical anthropologists, too, have contributed to the discussion. Debetz (1948), who had studied skeletal series from the Minusinsk Basin, believed that the trait combination displayed by the Andronov (Fedorov) crania was a distinct subtype of the Proto-European cranial type. Andronov populations of Minusinsk were, in his view, related to those living in the Kazakhstan steppes, where they all had allegedly originated. Alekseyev (1961) expressed the opinion, based on virtually the same material, that Andronov crania from the

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Minusinsk Basin resembled those from the Afanasyev graves in the Altai. This led him to the idea that Andronov populations might have originated in the Altai, where they descended from the Afanasyev people by means of random processes under isolation, and subsequently dispersed over vast territories. This idea, however, cannot be upheld by current available evidence because the archaeological research in the Altai, conducted over four decades after the publication of Alekseyev's article, has revealed neither traces of the Fedorov Culture, nor any populations showing biological affinities with the Andronov people.

At present, a large selection of skeletal material from Fedorov burials in West Siberia is available and the data has been partly published. Ironically, virtually none of it comes from either Kazakhstan or the southeastern Urals, the alleged alternative homelands of the Fedorov tradition Most information on the physical features of the Fedorov people must be obtained from burials in the northern and eastern edges of their distribution area. Materials studied so far point to the heterogeneity of these populations, evidenced by the presence of European, Mongoloid, and intermediate trait combinations (Alekseyev, 1961; Dremov, 1973, 1997; Molodin, Chikisheva, 1988) Mongoloid features are the most pronounced in Fedorov crania from West Siberia, as they are not merely dispersed as admixture, but concentrated in single individuals. A view shared by all specialists is that Mongoloid traits derive from the local populations Indeed, certain finds suggest that the Neolithic inhabitants of the South Siberian taiga were Mongoloids, who, in contrast to most Siberians, had low faces (Debetz, 1948: 61 – 63, Alekseyev, 1961: 120 – 124). The Neolithic series from the forest-steppe of northern Baraba suggests that West Siberia south of the taiga zone, too, was populated by Mongoloids, who had probably originated from the most ancient aborigines of North Eurasia (Polosmak et al., 1989).

The key issue in the evolution of the Fedorov population concerns the origins of the European-derived physical features associated with the Andronov cultural traits. Andronov groups were shown to have been genetically heterogeneous, and at least three trait combinations can be discerned. One of them has been traditionally referred to as the Andronov variant of the Proto-European complex. Being the most common in Fedorov tribes of the Minusinsk Basin and Kazakhstan, it is characterized by a large mesocranic braincase, broad, low, and orthognathic face sharply profiled in the horizontal plane, convex and sharply protruding nasal bones. Two other combinations correlate with dolichocrany. Certain Andronov burials in Kazakhstan contain massive, broad-faced dolichocranic skulls similar to those from Afanasyev burials and likewise displaying a Proto-European combination (Ginzburg, Trofimova, 1972: 93). Among the Alakul tribes of Western Kazakhstan, the predominant variant is more gracile, with a moderate facial breadth, often described as Mediterranean. It is also common in Timber Frame burials in the Lower Volga area.

The migration of Andronov tribes along the Eurasian steppes was accompanied not only by cultural interactions, but also by hybridization and the appearance of certain trait combinations in areas which were quite far away from their original distribution areas. In this article, we will present an overview of the physical differentiation of the Andronov tribes in West Siberia and trace the origins of certain morphological trait combinations.

This work has been presented more than once, most notably by Dremov (1997), who prepared a summary of virtually all human remains from the Andronov burials in West Siberia. Since then, however, new finds have been appearing, making it possible to specify certain details.

Genetic components in the Fedorov population in West Siberia and their origins

The largest material representing the West Siberian Andronov populations comes from the Tomsk area of the Ob River basin, and consists of a long skeletal series, with 68 male and 56 female crania, from the Yelovka-2 burial ground. Human remains from the Barnaul-Biysk and Novosibirsk areas of the Upper Ob River basin and from the Kuznetsk Basin, used in Dremov's monograph, are quite small. Remains from the central Baraba consist of a single skull from Vakhrushevo. All these were pooled into a series from the steppe area of the southern Upper Ob (Dremov, 1997).

New finds from West Siberia provide an opportunity to regroup the entire material into several samples representing local Andronov populations.

1. The Upper Ob River (Barnaul-Biysk and Novosibirsk): crania from Blizhnie Elbany XVI, Gilevo, Pavlovka VI, Podturino, Kytmanovo, Stepnoy Chumysh I, Yelunino, Ilyinka (all were published by Dremov (1993, 1997) where the

Table 1. Individual measurements of the male

Traits	Vakhrushevo-5, mound 2	Vengerovo-1, mound 3, grave 8	Abramovo-4, mound 22, grave 10	Sopka-2			
				mound 46, grave 1 (367)	grave 630	mound 30, grave 5 (326)	mound 46, grave 2 (368)
1 Cranial length	184.0	185.0	179.0	182.0	190.0	190.0	176.0
8 Cranial breadth	137.0	151.0	142.0	139.0	142.0	137.0	140.0
17. Basion - bregma height	141.0	139.0	136.0	138.0	138.0	131.0	125.0
20 Porion - bregma height	119.0	119.0	115.0	117.0	118.0	–	105.0
5 Basion - nasion length	100.0	107.0	101.0	102.0	103.0	103.0	100.0
9 Minimal frontal breadth	96.3	92.6	87.0	85.9	93.0	92.8	91.5
10 Maximal frontal breadth	122.0	123.0	114.0	120.0	116.0	120.0	114.0
11 Cranial base breadth	125.0	134.0	130.0	138.0	127.0	–	132.0
12 Biastenonic breadth	117.0	115.0	108.0	110.0	114.0	122.0	117.0
29 Frontal chord	116.8	112.5	108.7	111.0	112.0	116.3	103.5
30 Parietal chord	117.0	111.0	108.0	120.0	121.0	111.0	104.0
31 Occipital chord	99.4	111.3	96.0	89.0	98.2	99.5	90.8
26 Frontal arch	130.0	127.0	123.0	128.0	132.0	135.0	119.0
27 Parietal arch	130.0	122.0	123.0	132.0	133.0	125.0	112.0
28 Occipital arch	124.0	121.0	113.0	108.0	128.0	115.0	110.0
25 Sagittal arch	384.0	370.0	359.0	368.0	393.0	375.0	341.0
Transverse frontal curvature angle	135.7	138.8	138.9	150.0	138.3	128.1	138.6
Frontal subtense	21.7	21.0	21.8	22.5	24.8	27.2	22.0
Occipital subtense	27.3	25.0	18.0	23.3	128.0	25.5	19.6
45 Zygomatic breadth	138.0	141.0	142.0	147.0	138.0	140.0	143.0
40 Basion - prosthion length	102.0	102.0	96.0	98.0	101.0	91.0	93.0
48 Upper facial height	67.0	80.0	–	76.0	65.0	70.0	70.0
47 Total facial height	126.0	131.0	–	121.0	106.0	119.0	114.0
43 Upper facial breadth	108.0	110.0	103.0	106.0	106.0	106.0	107.0
46 Middle facial breadth	93.0	105.0	94.0	105.0	98.0	87.0	96.0
60 Alveolar arch length	59.0	56.0	54.0	57.0	55.0	50.0	56.0
61 Alveolar arch breadth	65.0	67.0	61.0	67.0	62.0	61.0	60.0
62 Palatal length	49.0	46.0	48.0	47.0	47.0	44.0	–
63 Palatal breadth	35.5	40.0	37.2	38.0	36.7	36.7	36.4
55 Nasal height	46.7	57.3	51.0	55.4	47.5	51.0	53.3
54. Nasal breadth	24.7	24.2	24.2	25.6	25.3	23.1	26.4
51 Orbital breadth (mf)	42.3	46.7	42.7	46.5	45.5	45.0	43.5
51a Orbital breadth (d)	41.4	43.2	41.0	42.8	41.6	42.3	–
52 Orbital height	28.8	32.0	35.6	36.6	28.6	32.5	35.5
Naso-malar angle	142.0	136.4	137.4	146.6	144.5	132.2	142.2
Zygo-maxillary angle	130.2	128.9	130.0	132.2	133.1	136.0	125.2
SC Simotic chord	10.8	6.9	7.5	6.0	6.5	8.2	4.7
SS Simotic subtense	6.3	4.0	3.1	4.1	3.9	7.2	–
MC Maxillo-frontal chord	21.2	18.2	20.2	16.6	18.0	19.8	19.0
MS. Maxillo-frontal subtense	10.4	12.0	6.6	7.2	5.9	8.2	–
DC Dacryal chord	22.0	23.2	22.2	20.0	21.1	–	–
DS. Dacryal subtense	14.8	15.2	10.9	10.2	12.2	–	–
FC Canine fossa depth	6.4	5.7	6.0	2.8	4.7	5.3	4.2
Zygomatic subtense	10.0	12.5	9.1	11.3	14.7	13.0	12.0
Zygomatic bone breadth (Wu)	58.9	62.2	57.9	57.8	61.2	55.0	53.5
32 Frontal profile angle (n)	75.0	80.0	80.0	78.0	89.0	–	74.0

crania from Andronov (Fedorov) burials

Chudinovka-1			Titovo			Tanay-4a, grave 1	Tanay-12					Yurman-1, mound 2
mound 1, grave 2	mound 2, grave 1	mound 3, grave 1	mound 11, grave A	mound 8, grave 2	mound 5, grave 5		mound 6, grave 1	mound 6, grave 3	square б – в – 35 – 36, burial	square г – 20 – 21	square в – г – 33	
184 0	173.0	171 0	195 0	178 0	180 0	183 0	177 0	190 0	178 0	183 0	170 0	205 0
145 0	137 0	139 0	138 0	137 0	144 0	140.0	131 0	135 0	142 0	148 0	143 0	135 0
139 0	133 5	137.0	–	–	130 0	131 0	143 0	148 0	128 0	129 0	122 0	148 0
117 0	114.0	109.5	116 5	117 6	109.4	115 0	116 0	125 5	112 5	114 5	113 0	–
107 0	99 0	99 0	–	–	108 0	102 0	107 0	112 0	100 0	105.0	95.0	118 0
102 0	91 5	99 5	95 3	90 0	98 5	90 3	94.3	95.0	89.0	103 0	92 0	95.5
127 0	117 0	119 0	111.0	114.0	119.0	114 0	107 0	113.0	118 0	125 0	116 0	116 0
131 0	124 0	124 5	122 0	113 0	125 0	128 0	123 0	126 5	127 0	131 0	125 0	–
114.0	107.0	104 0	107 0	–	113 0	109 0	110 0	107 5	112 0	112 0	111 0	112 0
111 5	114 0	110.5	117 3	109 8	105.8	106 2	108 2	120 0	111 0	115 0	103.8	118 5
116.5	98 5	106 0	114 0	114 0	108 0	114.0	115 5	104 0	108 0	110 0	105 3	124.0
91 5	96 0	94 5	94 5	–	86 6	98 0	85 3	112.5	91.5	92 0	88 0	98.0
125 5	130 0	126 0	131 0	122 0	120 0	117 0	122 0	138 0	130 0	131 0	115 0	134 0
130 0	109 0	119 0	125 0	125 0	120 0	130 0	132 0	111.0	119 0	120 0	115 0	138 0
112 0	115.0	114 0	112 0	–	119 0	121 0	101 0	135.0	112 0	109 0	120 0	123 0
367 5	354 0	359 0	368 0	–	359 0	368 0	355 0	384 0	361 0	360.0	350 0	395 0
137 2	139 2	135 2	126 9	136 8	126 5	142 9	124 2	124 5	136 0	131 9	137 2	135 6
22 0	25.5	26.0	23 5	22 4	21 6	19 6	22 2	26 5	25 5	25 5	20 5	26 0
26 5	23 5	26.0	24 0	–	24 5	30 0	19 0	30 0	21 0	22 2	30 0	32 5
139 0	131 0	132 0	–	–	134 0	143 0	132 0	134 0	138 0	138 0	128 0	–
97 0	94 0	100 0	–	–	104 0	101 0	99 0	103 0	101 0	101 0	101 0	114 0
76 5	66 0	67 0	71 0	72 0	74 0	72 0	61 5	71 5	76 0	71 0	71.0	67 5
117 0	109 0	108 5	–	116 0	122 0	118 0	108 5	113 5	127 0	116 0	118 0	110.0
114 5	104 5	107 0	104 0	103 0	105 0	108 0	105.0	104 0	109 0	112 5	108 5	106 0
100 0	103 0	97.0	100 0	95 0	–	104 0	91 0	91 0	94.0	102.0	93 0	100 0
57.0	55 0	57.0	–	50 0	55 0	54 0	51.0	56.0	54 5	57 0	59.0	60.0
64 5	66 0	61 5	–	65.0	61 0	65 0	63 0	61 0	65 0	64 0	62 0	64 0
48 0	46 0	49 0	–	–	51.0	45 0	43.0	50.5	48 0	–	49 0	50 0
38.0	39.0	35 0	–	33 0	33.0	38 5	32 0	33 2	36 0	38 0	37 0	35 4
54 5	50 0	50 0	54 0	53 0	52.7	50 0	45 5	56 3	52 0	52.0	50 5	47 5
21 5	22 5	26 0	26 0	23 0	–	26 0	24 5	23 8	24 3	23 5	24 3	24 5
44 5	42.0	41.0	–	39 5	–	46 5	45 7	46 5	43 0	46 0	44 5	44 0
42 5	37 5	36 5	–	–	–	41 5	40 0	44.5	39.0	44 0	40 5	–
34 0	30.5	32 5	32 6	35 0	–	31 0	32 3	31.0	32 0	32 0	32 0	29 0
132 9	141 9	144 0	128.7	135 2	131 9	137 0	132 7	131 9	142 4	133 9	146 6	136 6
131.8	128 4	124 5	125 8	118 1	–	130 0	128 3	118 2	133 3	127 1	124 7	127.6
9 0	7 0	10 0	–	9 4	–	8.5	7 5	7 0	4.0	7.4	7 0	10 0
5 5	3 0	3 5	–	5 5	–	4 2	4 5	4 0	1 0	3.0	3 5	4 0
19.5	16 0	20 5	–	–	–	19 3	18 5	16.0	19.5	23 0	15 5	19 0
10 5	5 5	6 0	–	–	–	6 5	10 5	11 0	6 5	9.0	6 5	10 0
20 0	21 0	23 0	–	–	–	23 5	21.5	18 5	25 0	26 0	17 0	–
15 0	12 0	11 0	–	–	–	13 5	15.0	16 5	12 0	12.2	10 0	–
6.0	1 5	3.0	5 7	5 4	3 2	5 0	4 0	6 5	3 0	5 0	3 3	–
10.0	10.0	10.5	8 3	9 2	11 6	8 5	13.0	–	9 5	9 0	11.5	–
57 5	50 0	54.0	52.0	55 3	56 1	55 5	57 5	–	59 0	53.0	54 0	–
76 0	83 0	89 0	–	–	77 0	81 0	81 0	88 0	82 0	79.0	81 0	–

Traits	Vakhrushevo-5, mound 2	Vengerovo-1, mound 3, grave 8	Abramovo-4, mound 22, grave 10	Sopka-2			
				mound 46, grave 1 (367)	grave 630	mound 30, grave 5 (326)	mound 46, grave 2 (368)
GM/FH Frontal profile angle (g)	68.0	74.0	72.0	70.0	80.0	–	64.0
72 Total facial angle	78.0	94.0	81.0	86.0	85.0	–	78.0
73 Middle facial angle	81.0	94.0	82.0	88.0	88.0	–	80.0
74 Alveolar angle	76.0	94.0	78.0	81.0	79.0	–	74.0
75(1) Nasal prominence angle	37.0	27.0	29.0	26.0	25.0	–	–
Mandible							
68(1) Bicondylar length	125.0	117.0	–	105.0	100.0	–	96.0
79 Ramus angle	124.0	114.0	–	131.0	125.0	116.0	123.0
68 Bigonial length	91.0	94.0	–	76.0	72.0	80.0	74.0
70. Ramus height	66.0	65.0	–	61.0	64.0	67.0	68.0
71a Minimal ramus breadth	37.0	40.0	–	39.0	36.0	38.0	37.0
65 Bicondylar breadth	121.0	121.0	–	133.0	119.0	–	136.0
66 Bigonial breadth	112.0	96.0	–	111.0	106.0	108.0	102.0
67 Anterior breadth	49.0	45.0	–	48.0	45.0	47.0	47.0
69 Symphyseal height	42.0	38.0	–	31.0	29.0	34.0	34.0
69(1) Height of corpus	35.0	33.0	–	31.0	28.0	34.0	31.0
69(3) Thickness of corpus	14.0	12.0	–	12.0	13.0	14.0	11.0
C Chin angle	66.0	69.0	–	70.0	70.0	–	78.0
Glabella (1 – 6)	6	4	4	5	6	4	6
Superciliary arches (1 – 3)	2	2	2	3	3	2	2
Inion (0 – 5)	3	3	1	2	5	0	3
Mastoid process (1 – 3)	3	3	2	2	2	2	2
Lower margin of pyriform aperture	F pr	Anthr	Anthr	Anthr.	Anthr	Anthr	Anthr
Anterior nasal spine (1 – 5)	5	5	4	3	4	5	3

information on these sites is provided), and Katkovo-2, excavated by Kolontsov in 2000 (crania were studied by Pozdnyakov).

2. Kuznetsk Basin· crania from Zarechnoe I, Vaskovo V, Bolshoe Pichugino, Titovo II, and Chudinovka-1. Crania from the two former sites and those partly from Titovo II were published by Dremov (1993), where the information on these sites is given. Chikisheva studied other crania from Titovo II (1987 excavations), while crania from Chudinovka-1, excavated by Ilyushin in 1997 – 1998, Tanay-12 and Yurman-1, excavated by Bobrov in 2001, were studied by Pozdnyakov.

3. The Baraba forest-steppe: crania from Preobrazhenka-3, Vengerovo-1, Abramovo-4, Sopka-2, and Vakhrushevo. Those from the former site were published by Chikisheva ((Molodin, Chikisheva, 1988), where information about the site is provided). Dremov (1973) measured the skull from Vakhrushevo, and other crania were studied by Chikisheva.

4. Tomsk area, the Ob River basin: crania from Yelovka-2 were published by Dremov (1997).

We considered it necessary to publish individual data on the new Andronov crania from West Siberia (Tables 1, 2) in order to provide the possibility of rearranging the material if necessary.

Judging by the averages, West Siberian people, who were associated with the Fedorov Culture (Tables 3, 4), differed from their counterparts in Minusinsk, who were commonly believed to have displayed the "standard" Andronov variant of the Proto-European trait combination in many respects. Specifically, in male groups from West Siberia, the principal dimensions of the braincase are smaller. The frontal bone is more narrow and less profiled, the face is higher and more mesognathic, the nasal aperture more narrow, and the nasal protrusion less than in the Minusinsk sample. In West Siberian females, cranial breadth is regularly less than in the Minusinsk group. In

Table 1 continued

Chudinovka-1			Titovo			Tanay-4a, grave 1	Tanay-12					Yurman-1, mound 2
mound 1, grave 2	mound 2, grave 1	mound 3, grave 1	mound 11, grave A	mound 8, grave 2	mound 5, grave 5		mound 6, grave 1	mound 6, grave 3	square б–в–35–36, burial	square г–20–21	square в–г–33	
68.0	73.0	82.0	–	–	72.0	74.0	72.0	82.0	71.0	69.0	75.0	–
87.0	89.0	78.0	–	–	88.0	85.0	82.0	84.0	85.0	88.0	86.0	–
89.0	92.0	83.0	–	–	91.0	90.0	84.0	85.0	91.0	93.0	88.0	–
80.0	72.0	59.0	–	–	80.0	72.0	74.0	81.0	74.0	68.0	72.0	–
33.0	24.0	27.0	–	–	–	30.0	37.0	29.0	26.0	22.0	23.0	36.0
108.0	104.0	104.0	104.0	103.0	112.0	108.5	111.0	109.5	112.0	112.0	118.0	–
121.0	117.0	114.0	114.0	115.0	116.0	106.0	122.0	116.0	118.0	116.0	125.0	–
78.0	80.0	83.0	83.0	81.0	85.0	93.0	87.0	86.0	87.0	91.0	90.0	–
69.0	66.0	61.0	61.0	59.0	73.0	68.0	55.0	64.0	62.0	56.0	59.0	–
33.5	35.5	39.0	39.0	36.0	37.0	39.0	35.5	33.0	34.0	35.0	36.0	–
124.5	117.5	120.0	120.0	125.0	134.0	121.5	126.0	128.0	–	112.0	123.0	–
105.5	98.0	95.0	95.0	96.0	110.0	100.5	103.5	96.0	112.0	92.0	–	–
46.0	47.0	46.0	46.0	46.0	47.0	47.0	42.5	49.0	46.0	44.0	46.0	–
32.0	30.5	31.0	31.0	32.0	35.5	33.0	32.5	40.0	33.0	35.0	33.5	–
31.0	30.0	31.0	31.0	31.0	34.0	30.0	30.5	38.0	32.0	32.0	35.0	–
12.0	12.0	14.0	14.0	10.0	12.0	14.0	13.0	12.0	13.0	13.0	13.0	–
69.0	64.0	70.0	70.0	80.0	76.0	69.0	63.0	74.0	73.0	74.0	64.0	–
4	3	3	3	4	3	4	3	4	5	3	4	–
1	2	1	1	2	2	2	1	2	2	1	2	–
2	0	3	3	–	1	4	4	5	2	0	–	–
2	1	1	1	3	1	2	1	1	2	2	2	–
Anthr	Anthr	Inf	Inf	Anthr	F pr	Anthr	Anthr	F pr	Anthr	Anthr	F pr	–
3	2	1	1	5	3	1	3	2	1	2	2	–

contrast to the situation in males, the face is higher in Minusinsk. Females from the Upper Ob are the least different from those in Minusinsk in terms of frontal width and frontal profile angle, whereas in other series, the frontal bone is more narrow and more sloping. Like the males, all West Siberian females differed from those in Minusinsk by a mesognathic face and less protruding nasal bones.

Overall, the presence of the Mongoloid admixture in the Fedorov groups of West Siberia is supported by new cranial evidence. The degree of divergence from the Minusinsk trait combination varies across West Siberian groups, possibly due to different proportions of aboriginal and immigrant populations.

The homogeneity of the groups was assessed by comparing the observed within-group variances with standard (average) ones, as published by Alekseyev and Debetz (1964) and based on within-group variances in a large number of cranial series worldwide. The significance of the variance ratio was tested by means of the F-distribution. Traits in which the F-ratio was significant are few and vary with regard to locality and sex (Tables 5, 6). Female groups are generally more homogeneous than the males. Within-group heterogeneity is the highest in the series from the Kuznetsk Basin. Traits in which West Siberian populations show a Mongoloid tendency are no more variable than others at the within-group level. In contrast, bizygomatic width and nasal prominence angle in Minusinsk males do show increased variation. General mesognathy in the Baraba group, too, is just an average tendency, based on contrasting variants of the facial angle.

The analysis of observed within-groups variances, consequently, indicates that the local Fedorov populations of West Siberia were not a "mechanical" mixture of Mongoloids with European-derived immigrants. Rather, their trait combinations were stable and, if they resulted

Table 2. Individual measurements of female

Traits	Abramovo-4, mound 21, grave 1	Sopka-2			Katkovo-2			
		mound 44, grave 1 (354)	mound 25, grave 7 (225)	mound 18, grave 5	grave 8	grave 9	grave 10	grave 13
1 Cranial length	184.0	172.0	193.0	171.0	175.0	175.0	179.0	178.0
8 Cranial breadth	136.0	139.0	–	139.0	136.0	144.0	141.0	138.0
17 Basion - bregma height	–	123.0	–	137.0	142.0	–	135.0	141.0
20. Porion - bregma height	115.0	111.0	–	118.0	120.0	124.0	116.0	118.0
5 Basion - nasion length	–	96.0	–	98.0	104.0	–	103.0	101.0
9 Minimal frontal breadth	92.0	89.0	–	94.5	97.5	98.6	97.5	96.5
10. Maximal frontal breadth	109.0	109.0	–	121.0	115.0	–	109.0	106.0
11. Cranial base breadth	117.0	127.0	–	123.0	119.0	114.0	122.0	123.0
12 Biasterionic breadth	–	111.0	–	116.0	109.0	117.5	109.0	106.0
29 Frontal chord	104.6	102.8	114.2	112.4	114.0	124.5	111.1	110.0
30 Parietal chord	108.0	106.0	–	113.0	111.4	117.4	110.5	118.0
31 Occipital chord	106.3	91.0	–	91.7	96.0	84.8	92.8	91.5
26. Frontal arch	116.0	114.0	128.0	–	130.0	144.0	127.5	128.0
27 Parietal arch	119.0	117.0	–	–	123.0	130.0	122.0	132.0
28 Occipital arch	131.0	110.0	–	–	111.0	102.0	113.5	112.0
25 Sagital arch	–	–	–	–	364.0	376.0	363.0	372.0
40 Basion - prosthion length	–	98.0	–	93.0	97.0	–	105.0	96.5
48 Upper facial height	–	61.0	–	61.0	61.0	65.0	68.0	69.5
47 Total facial height	–	–	–	104.0	100.5	108.0	112.0	113.5
43 Upper facial breadth	103.0	105.0	–	96.0	104.0	102.0	107.0	107.0
46 Middle facial breadth	–	96.0	–	86.0	–	90.0	99.0	94.0
60 Alveolar arch length	–	54.0	–	50.0	50.0	–	58.5	54.5
61 Alveolar arch breadth	–	60.0	–	53.0	57.5	–	61.0	57.2
62 Palatal length	–	–	–	43.0	–	–	55.0	44.0
63 Palatal breadth	–	37.6	–	31.4	31.0	–	33.0	30.4
55 Nasal height	–	45.6	–	45.0	45.3	48.5	50.3	50.7
54. Nasal breadth	–	23.4	–	24.5	23.5	–	23.3	26.6
51. Orbital breadth (mf)	–	–	42.4	40.5	42.4	–	42.3	44.2
51a Orbital breadth (d)	–	–	–	38.5	39.3	–	39.6	39.0
52 Orbital height	–	–	–	33.3	32.6	–	33.6	32.0
Naso-malar angle	134.2	142.8	–	147.0	133.0	129.1	138.6	138.6
Zygo-maxillary angle	118.6	134.2	–	131.6	–	125.1	126.6	119.2
SC Simotic chord	–	–	–	6.4	10.5	–	8.7	8.0
SS. Simotic subtense	–	–	–	4.0	5.3	–	3.3	3.3
MC. Maxillo-frontal chord	–	–	–	15.2	20.0	–	19.0	12.1
MS Maxillo-frontal subtense	–	–	–	7.3	7.4	–	8.6	7.7
DC Dacryal chord	–	–	–	16.0	22.6	–	22.2	21.8
DS Dacryal subtense	–	–	–	12.8	13.0	–	11.1	11.0
FC. Canine fossa depth	5.0	7.0	4.1	7.0	4.3	–	5.0	4.0
Zygomatic subtense	8.7	–	14.0	8.5	9.5	–	11.5	8.4
Zygomatic bone breadth (Wu)	49.6	–	55.8	50.9	52.8	–	55.0	52.8
32 Frontal profile angle (n)	78.0	80.0	–	87.0	87.0	88.0	85.0	93.0
GM/FH Frontal profile angle (g)	73.0	75.0	–	80.0	82.0	85.0	78.0	85.0
72 Total facial angle	–	83.0	–	86.0	88.0	95.0	82.0	85.0
73 Middle facial angle	–	85.0	–	89.0	85.0	90.0	84.0	87.0

crania from Andronov (Fedorov) burials

Chudinovka-1					Titovo				Tanay-12			
mound 8, grave 1	mound 9, grave 1	mound 9, grave 3	mound 10, grave 1	mound 33, grave 1	mound 11, burial A	mound 8, grave 1, burial 4	mound 8, grave 1, burial A	mound 8, grave 1, burial 4	mound 5, grave 1	mound 13, grave 1	square б – в – 19 – 20	square г – 34 – 35
170.5	165.0	172.0	180.0	178.0	177.0	183.0	175.0	–	178.0	179.0	175.0	183.0
135.0	137.0	144.0	135.0	144.0	133.0	139.0	135.0	–	–	133.0	147.0	147.0
135.0	135.0	136.0	125.0	–	144.0	132.0	133.0	–	130.0	128.0	125.0	130.0
112.0	113.5	111.0	112.0	119.0	113.5	118.0	–	–	–	114.0	112.0	118.0
96.0	97.0	98.5	92.5	–	108.0	101.0	105.0	–	114.0	98.0	98.0	100.0
94.0	94.0	96.0	91.5	99.0	93.1	90.4	92.0	93.1	–	91.0	92.0	95.5
118.0	117.0	114.0	115.0	130.0	108.0	108.0	116.0	–	–	113.0	115.0	122.0
118.0	125.0	125.0	119.0	124.0	114.0	125.0	–	–	–	120.0	128.0	131.0
96.0	104.5	105.0	101.0	109.5	105.0	110.0	101.0	–	109.0	104.0	112.5	110.0
106.0	106.5	107.0	111.0	111.5	108.0	107.8	109.3	108.0	112.3	103.3	107.0	108.0
116.5	102.5	114.0	114.5	108.5	113.0	115.0	112.0	–	95.0	110.2	97.5	117.0
88.5	97.0	86.0	86.5	88.0	91.2	98.2	86.0	–	95.5	94.5	96.0	89.0
125.0	121.0	123.0	130.0	131.0	123.0	119.0	123.0	123.0	130.0	119.0	120.0	122.0
134.0	115.0	130.0	125.0	133.0	126.0	129.0	126.0	–	102.0	122.0	106.0	131.0
104.0	114.0	110.0	111.0	109.0	109.0	120.0	104.0	–	115.0	120.0	121.0	110.0
363.0	350.0	363.0	366.0	373.0	358.0	–	353.0	–	347.0	361.0	347.0	363.0
95.0	92.0	93.0	90.0	–	105.0	100.0	99.0	–	110.0	102.0	95.0	105.0
66.0	67.0	65.0	67.0	66.3	63.0	66.0	66.0	65.0	68.0	67.5	72.5	69.0
108.5	109.0	–	111.5	110.0	–	110.0	–	–	109.0	–	111.0	–
103.0	102.5	105.0	100.0	106.0	103.0	104.0	99.0	105.0	106.0	100.5	104.0	105.0
92.5	92.0	94.0	85.5	–	81.0	95.0	85.0	91.0	89.0	90.0	92.0	101.0
53.0	53.0	54.5	51.0	52.5	53.0	55.0	54.0	52.0	56.0	55.0	50.0	–
59.0	61.5	64.5	59.0	57.5	50.0	62.0	54.0	57.0	61.5	61.0	59.0	–
45.0	46.0	44.0	45.0	–	–	46.0	–	–	–	48.0	42.0	–
28.5	34.0	33.0	36.0	46.0	25.6	34.0	29.0	33.4	30.0	31.5	35.0	–
48.0	48.0	49.0	48.0	53.6	46.6	46.2	47.0	46.3	48.0	49.0	50.4	53.4
24.5	22.0	24.5	22.5	26.0	22.3	21.7	22.3	24.8	26.5	23.0	21.0	25.4
39.0	41.0	40.0	42.0	43.8	43.4	40.8	42.0	40.3	45.3	40.0	45.0	43.0
36.0	39.0	–	39.0	39.3	41.0	38.3	–	–	40.0	37.0	42.0	40.5
33.0	30.5	30.0	30.0	33.0	32.0	30.6	31.3	31.7	34.7	32.0	34.0	34.0
141.3	141.7	136.2	133.9	137.0	135.0	136.8	134.6	–	145.6	143.7	142.4	125.1
130.4	125.3	128.6	123.4	–	116.1	133.9	122.2	126.0	120.5	128.9	124.7	124.9
9.0	5.5	12.0	6.0	8.5	7.5	7.3	–	–	8.7	8.2	7.0	8.0
3.5	2.5	6.5	3.5	3.6	3.8	4.4	–	–	4.0	3.7	3.0	3.2
23.0	18.0	21.5	18.0	19.5	21.0	21.0	19.4	–	19.0	19.5	16.8	20.5
7.0	6.5	10.5	7.5	5.6	9.0	8.6	–	–	6.0	7.0	7.2	7.0
24.0	18.0	–	18.5	24.0	21.8	21.3	–	–	21.5	–	17.3	24.5
13.0	9.5	–	10.5	12.5	15.5	14.3	–	–	14.0	–	12.2	9.0
4.5	2.0	5.0	2.0	6.5	5.5	5.6	4.7	5.3	–	4.0	3.2	2.0
10.0	11.5	10.5	11.0	9.8	10.8	9.5	9.0	9.8	–	10.5	8.0	13.5
50.0	55.5	51.0	56.0	51.5	56.7	54.0	54.0	49.3	–	55.5	49.5	57.0
91.0	90.0	86.0	90.0	90.0	83.0	86.0	85.0	–	–	91.0	79.0	82.0
86.0	86.0	80.0	82.0	86.0	78.0	81.0	80.0	–	–	85.0	72.0	75.0
81.0	87.0	84.0	85.0	87.0	77.0	86.0	–	–	–	82.0	89.0	83.0
86.0	91.0	86.0	90.0	91.0	80.0	89.0	–	–	–	85.0	90.0	88.0

Traits	Abramovo-4, mound 21, grave 1	Sopka-2			Katkovo-2			
		mound 44, grave 1 (354)	mound 25, grave 7 (225)	mound 18, grave 5	grave 8	grave 9	grave 10	grave 13
74. Alveolar angle	–	75.0	–	82.0	83.0	78.0	73.0	76.0
75(1). Nasal prominence angle	–	–	–	26.0	33.0	–	22.0	19.0
Mandible:								
68(1). Bicondylar length	104.0	–	–	87.0	98.0	100.0	106.5	102.0
79. Ramus angle	125.0	119.0	–	132.0	116.0	120.0	114.0	112.0
68. Bigonial length	78.0	73.0	–	61.0	77.0	76.0	83.0	81.0
70. Ramus height	54.0	70.0	–	53.0	63.5	53.0	63.5	62.5
71a. Minimal ramus breadth	32.0	39.0	–	33.0	32.0	35.0	39.2	35.0
65. Bicondylar breadth	112.0	–	–	–	113.0	106.0	110.5	113.0
66. Bigonial breadth	100.0	–	–	102.0	93.0	83.5	94.0	98.0
67. Anterior breadth	42.0	43.0	–	41.0	43.0	42.0	46.5	47.0
69. Symphyseal height	27.0	30.0	–	–	31.0	30.0	35.0	36.0
69(1). Corpus height	25.0	29.0	–	26.0	29.0	26.0	32.0	32.0
69(3). Corpus breadth	11.0	12.0	–	10.0	12.0	12.0	14.0	11.0
C. Chin angle	62.0	75.0	–	–	66.0	79.0	77.0	77.0
Glabella (1 – 6)	3	4	2	3	2	1	2	2
Superciliary arches (1 – 3)	2	1	1	2	1	1	2	2
Inion (0 – 5)	–	0	0	0	3	0	0	3
Mastoid process (1 – 3)	2	1	2	2	1	1	1	2
Lower margin of pyriform aperture	Anthr.	Anthr.	Inf.	Anthr.	Inf.	Anthr.	Anthr.	F. pr.
Anterior nasal spine (1 – 5)	3	4	–	–	2	2	1	2

from hybridization, the process must have occurred over a considerable amount of time.

The number of generations required for a stable hybrid phenotype to develop is not clear. However, actual hybridization processes observed in South Siberia (Gokhman, 1973; Ismagulov, 1970; Khrisanfova, Perevozchikov, 1991), and eastern Central Asia (Gokhman, 1980) span several centuries and dozens of generations.

As a result, the observed cranial data disagree with the estimated time period over which the Fedorov Culture is commonly believed to have existed in West Siberia: between the 13th and the 12th centuries BC. The hybridization process must have taken much longer. Alternatively, it may have occurred earlier and elsewhere.

Turning to the origins of the West Siberian Andronov populations, we must overstep both the temporal and the spatial boundaries of this culture. While looking for the affinities of these populations, we have compared them to other Andronov series as well as to those associated with the Timber Frame, Pit-Grave and Catacomb, Samus-Seyma, and Okunev cultures. We have used the following nineteen cranial measurements: cranial length, breadth, and height, minimal frontal breadth, frontal profile angle, bizygomatic breadth, upper facial height, naso-malar and zygo-maxillary angles, total facial angle, orbital and nasal breadth and height, dacryal and simotic chords and subtenses, and nasal protrusion angle. Multiple discriminant analysis based on individual data was utilized. We selected four discriminant functions with the highest discriminatory power and assessed the position of groups with respect to these functions. We believe that the most suggestive graphical representation is a dendrogram reflecting the clustering of squared Euclidean distances calculated on the basis of functions selected. The software used was STATISTICA for Windows.

For comparative purposes, we used the pooled Andronov series from Minusinsk (Alekseyev, 1961), Northern, Central, and Eastern Kazakhstan (Debetz, 1948; Ginzburg, 1956; Ismagulov, 1963), and Western Kazakhstan (Alekseyev, 1964; Ginzburg, 1962; Komarova, 1927) as well as crania from Krasnogorsk, the Urals, associated

Table 2 continued

Chudinovka-1					Titovo				Tanay-12			
mound 8, grave 1	mound 9, grave 1	mound 9, grave 3	mound 10, grave 1	mound 33, grave 1	mound 11, burial A	mound 8, grave 1, burial 4	mound 8, grave 1, burial A	mound 8, grave 1, burial 4	mound 5, grave 1	mound 13, grave 1	square б – в – 19 – 20	square г – 34 – 35
69.0	71.0	72.0	71.0	72.0	72.0	80.0	–	–	–	68.0	85.0	73.0
33.0	23.0	24.0	26.0	19.0	27.0	28.0	–	–	26.0	24.0	22.0	17.0
96.0	104.0	–	105.0	103.0	–	111.0	–	–	99.0	–	104.0	–
121.0	123.0	–	124.0	121.0	–	123.0	–	109.0	79.0	–	125.0	–
70.0	75.0	–	73.0	76.0	–	84.0	–	81.0	87.0	–	78.0	–
59.0	59.0	–	66.0	60.0	–	58.0	–	56.0	60.0	–	47.0	–
37.0	35.0	–	30.5	30.0	–	36.0	–	35.0	33.0	–	30.5	37.0
114.0	114.5	–	–	116.0	–	118.0	–	–	124.0	–	118.5	–
95.5	87.5	–	91.0	92.5	–	98.0	–	92.0	90.0	–	95.0	–
47.0	40.0	–	39.5	43.5	–	45.0	–	40.0	47.5	–	43.0	–
32.0	32.0	–	32.0	29.0	–	28.0	–	31.0	31.0	–	30.5	32.5
29.0	31.0	–	32.0	28.0	–	30.0	–	28.0	31.0	–	31.0	32.0
11.5	10.5	–	10.0	12.0	–	11.0	–	11.0	12.0	–	11.0	12.0
82.0	74.0	–	63.0	72.0	–	76.0	–	73.0	76.0	–	67.0	
1	1	2	2	1	3	2	3	3	1	2	2	2
1	1	1	1	1	1	1	1	1	1	1	1	1
1	5	0	4	2	–	–	–	–	3	1	1	1
1	1	1	1	1	3	3	2	1	1	1	1	1
Anthr	Anthr.	Anthr	Anthr	Anthr	Anthr.	Anthr	Inf	Inf	F pr	Inf	Anthr	Inf
3	2	1	3	2	4	5	5	4	1	1	2	1

with the Cherkaskul Culture (Shevchenko, 1980), those from Kokcha-3, Southern Aral area, the Tazabagyab Culture (Ginzburg, Trofimova, 1972); the pooled series from the Timber Frame burials in the Volga area (Ginzburg, 1959; Glazkova, Chtetsov, 1960; Firshtein, 1967), Afanasyev series from Minusinsk Basin (Alekseyev, 1961), Gorny Altai (Ibid.) (crania excavated in 1988 and 1994 were measured by Chikisheva, unpublished), and Gumugou, Xinjang (Han Kangxin, 1986); pooled series from the Pit Grave and Catacomb Culture burials in the Volga area (Ginzburg, 1959; Glazkova, Chtetsov, 1960; Firshtein, 1967) and in the Dnepr River basin (Kruts, 1984); those from Krotovo burials in Sopka-2, the Baraba forest-steppe (Chikisheva, unpublished); and the pooled Okunev series (Gromov, 1997).

In both males and females, the first two discriminant functions (DFs) account for over 60% of the variance, and the first four DFs for 80%. The following traits have the highest loadings. DF1: nasal protrusion angle, dacryal subtense, and zygo-maxillary angle; DF2: nasal protrusion angle, cranial breadth, and bizygomatic breadth (Table 7). In both DFs, these traits are combined broadly similarly in males and females. According to the loadings, DF1 distinguishes groups with a sharp horizontal facial profile, convex and sharply protruding nasal bones, and DF2 reveals a combination of narrow skull and face with a less protruding nose.

The results of cluster analysis are presented in Figures 1 and 2. In the male dendrogram (Fig. 1), there are two large clusters, one of which includes virtually all Andronov and Timber Frame groups (except the Fedorov group from the Barabinsk forest-steppe) plus two earlier Bronze Age populations: Krotov and Okunev. The second cluster encompasses Andronov people of Western Kazakhstan, those of the Tazabagyab Culture (the closest to the Baraba Fedorov group), and populations of the Pit Grave, Catacomb, and Afanasyev cultures.

Siberian aborigines associated with the Krotov and Okunev cultures exhibit pronounced affinities with Fedorov people of the Tomsk Ob area and with those of the Cherkaskul Culture. Local populations of the Upper Ob and the Kuznetsk

Table 3. Average measurements of male cranial series from Andronov (Fedorov) burials in West and South Siberia

Trait codes	Baraba forest-steppe			Kuznetsk Basin			Upper Ob			Tomsk area			Minusinsk Basin		
	m	n	s	m	n	s	m	n	s	m	n	s	m	n	s
1	185 11	9	5 53	181 32	19	8 50	182 50	10	5.80	185 12	25	7 83	187 20	22	6 71
8	140.67	9	4 53	139 68	19	4 88	143 00	10	4 19	146 28	18	7.39	145 00	22	6 12
17	135 43	7	5 56	135 50	17	7 01	136 40	10	7 83	135 93	15	5.62	138 70	21	4 03
20	116 14	7	5 18	115 14	18	3 81	117 67	9	4 46	116.06	16	3 68	117 90	18	3 24
5	102 29	7	2 43	105.06	17	5 89	102 80	10	6 43	106 92	13	5.91	106 30	21	3.55
9	92 14	8	4 12	95 80	20	4 01	98 33	12	4 62	96 00	38	4 61	100 90	23	4.42
10	118 43	7	3 74	117 16	19	4 83	121 45	11	4 68	119 61	23	6 90	124 20	18	4.47
40	97 57	7	4 43	101 35	17	5 02	101 35	10	6 42	99 11	10	4 95	101.40	19	5 46
45	141 29	7	3 15	134 19	16	4 51	139 00	9	5.15	142 00	14	4 35	141 50	20	7 94
48	72 43	7	5 91	69 65	20	3 91	68 50	10	4 45	70 17	35	3 41	68 30	20	4 61
51	44 60	7	1 78	43 73	18	1 95	43 50	12	1 68	44 41	34	2 09	44 80	17	1.89
52	32 80	7	3 26	31 84	19	2 02	32 50	12	5 48	32 84	37	1.98	31 70	19	1 58
54	24 72	9	0 98	24 70	19	2 39	26.22	11	2 13	25 57	34	1.68	26 10	20	1.68
55	52 78	8	4 64	50 60	20	3 04	49 90	10	3 18	50 57	35	3 05	50 50	20	0.77
DS	12 66	5	2 26	13 10	14	1 87	12.61	9	2 22	12 05	22	1 01	13 40	17	1 24
DC	21 70	5	1 21	22.36	15	2 60	22 83	9	2 30	23 38	24	3 30	22 30	17	3.53
SS	4 91	9	1 33	3 99	17	1 28	4 60	9	1 11	4.28	29	0 85	4 70	18	0 96
SC	7 95	10	2 06	8 59	17	2 41	8 30	9	1 10	8 48	31	1 92	9 10	18	1 93
32	79 43	7	4 89	81 69	16	4 27	83 10	10	4 23	78 15	13	4 81	83 30	16	4.13
77	138 99	8	5 77	136.39	20	5 08	140 46	13	6 29	138 71	35	4.91	139 20	18	4 84
zm'	129 98	8	3 93	126 88	19	4 95	129 94	8	5 57	133 13	16	5 24	128 10	18	4 76
72	84 57	7	6 05	85 50	16	2 88	84 90	10	3 90	84.33	9	4 27	85 50	17	3 25
74	80 71	7	6 58	76 25	16	7 78	79 67	9	7 52	76 27	11	7 25	82 60	16	5 87
75(1)	28 50	6	4 37	28 75	16	5 77	28 10	10	5 34	22 83	23	5 25	31.90	16	6.64
8·1	76 06	9	3 63	77 23	19	4 95	78 98	9	3 73	79 88	18	4 02	77 50	22	3.19
9 8	64.75	7	3 49	68 77	17	3 38	68 75	9	3 17	65 85	18	2.41	69 70	22	3 90
17.1	73 74	7	2 92	75 03	17	3.36	75.26	9	3 56	73 52	11	4.38	74.10	20	3.39
17 8	96 02	7	4 49	97 05	17	7 67	94 44	9	4.85	91.69	7	7.13	95 70	20	4 37
26 25	34 72	9	0 82	34.69	12	1 53	–	–	–	–	–	–	–	–	–
27 25	33 86	9	0 96	33 52	12	2 17	–	–	–	–	–	–	–	–	–
28 25	31 42	9	1 28	31 79	12	1 89	–	–	–	–	–	–	–	–	–
28 27	92 91	9	5.89	95 49	12	11 39	–	–	–	–	–	–	–	–	–
40 5	95 41	7	4.22	96 58	17	4 03	98 68	10	4 47	99 11	10	4.95	96 30	19	3.21
45.8	100 20	7	3.97	95.75	16	3 53	97 24	8	3 18	95 85	12	3 29	97 58	19	4 01
48 17	50 57	6	3.13	49 58	17	2 82	47 85	9	3 89	47 35	6	3 26	49 20	20	3.46
48 45	50 51	6	3.42	51 78	16	2 95	49 53	9	3 57	48 96	12	2 25	48.10	19	3.06
52 51	73.63	7	7.74	73 25	17	5 87	74.86	12	5 91	74.26	34	4.49	70 90	17	4 74
54 55	47.11	8	4.72	49 14	19	6.20	53 15	10	5 85	50 57	30	3 38	51 70	20	3.25
DS:DC	58 14	5	8.23	60 16	14	12 51	55 58	9	10 35	51 34	22	7.51	62.10	17	10.69
SS.SC	59 56	9	12 79	46 94	17	13 31	55 51	9	11 88	51 81	29	12.51	53 70	18	14 42

Table 4 Avarage measurements of female cranial series from Andronov (Fedorov) burials in West and South Siberia

Trait codes	Baraba forest-steppe			Kuznetsk Basin			Upper Ob			Tomsk area			Minusinsk Basin		
	m	n	s	m	n	s	m	n	s	m	n	s	m	n	s
1	175 56	9	9 26	176 31	18	6 59	177 17	12	2 89	178 05	22	5 91	177 00	13	6 82
8	140 33	9	6 46	138 18	17	4 76	138 92	12	4 42	137.50	16	4 77	142 30	12	7 05
17	127.80	5	5 59	130 71	17	5 14	134 30	10	5 25	130 86	14	5 20	132 00	13	5 53
20	111 94	8	4 19	113 19	16	3 79	115 67	9	4 69	112 23	13	5 57	115 30	10	4.65
5	98.80	5	3 96	100 53	17	5 00	101 20	10	2 86	100 3	10	4 67	98 60	13	4 33
9	91 19	8	3 66	93 59	18	3 47	96 84	12	3 21	93.24	25	4 03	96 80	14	5 13
10	116 50	8	8 43	115 47	17	5 19	116 10	11	6 35	117 43	14	4 09	117 30	9	6 51
40	98.25	4	6.18	98 88	17	5 54	98 56	8	2 92	100 29	7	2 69	95 70	11	4 82
45	129 50	2	–	128 53	15	3 23	129 33	9	4 42	129 71	14	5 25	128 20	11	5 85
48	63.20	5	2 09	67 44	19	2 48	66 05	10	3 08	65 60	25	2 38	68 60	13	4 05
51	41 80	5	2 37	42 09	18	1 72	42 77	9	0.85	42.91	23	1 76	42 80	10	1 91
52	31 20	4	1 95	32 21	18	1 46	32 97	9	0 69	33 48	23	1 70	33 50	14	1.07
54	24 50	4	0 83	23.46	18	1 61	24 53	9	1.19	24 60	26	2 19	24 00	13	1 59
55	47 70	4	2 47	48 92	19	2 20	49 18	10	1 98	47 25	24	2 25	50 00	13	2 78
DS	11 92	4	2 05	11 79	13	2 12	12 23	9	1 02	11 32	14	1 77	11.80	11	1 06
DC	19.75	4	3 28	21 11	13	2 32	20 97	9	1 84	21 78	15	1 13	20 50	11	1.62
SS	3 90	4	1 45	3 78	16	1 13	4 56	9	0 97	3 76	16	0 79	3 90	11	1 25
SC	8.04	5	1 44	7 92	16	1 70	9 21	9	1 74	7.68	17	1 70	7 90	11	1.83
32	83 80	6	3 82	84 25	16	5 43	85 22	9	4 74	82 86	7	2 73	87 50	11	3 96
77	139 80	7	6.39	138 24	18	5 67	137.03	12	5 10	140 52	21	4 71	140.20	10	4 79
zm'	129.50	5	6 67	127 05	17	5 81	126 13	7	5 18	128 67	12	2 99	125.60	8	4 81
72	82 00	5	6 59	84 53	15	3 85	85 33	9	4 24	81 86	7	3 34	86 70	10	2 59
74	73 60	5	7 17	75 33	15	6 43	77 89	9	6.03	76 00	7	6 56	85 90	9	4 50
75(1)	22 00	4	5 89	24 75	16	4 67	24 50	8	5 88	21 54	12	6 01	25 20	11	4 15
8.1	80 43	8	5 83	78 52	17	3 90	78 43	12	2 94	78 13	15	3 59	80 50	12	4 27
9·8	65.65	8	3 83	67 79	17	2 63	69 75	12	2 59	67 83	15	2.80	68 40	12	4.62
17 1	74.52	5	3 65	74 32	17	4 80	75 85	10	3 24	73 65	13	1 52	74.70	13	3 78
17 8	91.17	5	4 28	95 00	16	5 56	96 77	10	4 92	95 18	11	5 32	92 60	12	4 22
26 25	34 66	3	1 38	34 67	11	1 17	35 89	4	1 69	–	–	–	–	–	–
27 25	33 06	3	0 95	34 19	11	2.39	34 36	4	0.86	–	–	–	–	–	–
28 25	32 28	3	0 52	31 14	11	1 99	29 75	4	1.81	–	–	–	–	–	–
28 27	97 93	6	6 75	91 95	12	11 95	86 65	4	6.43	–	–	–	–	–	–
40 5	99 72	4	3 35	98 39	17	3 69	97 62	8	2 97	100 84	7	4.63	96 70	11	3 14
45 8	93 17	2	–	92 65	15	2.26	93 73	9	2 61	95 30	12	2 27	87 68	7	4 27
48 17	44 65	4	0 93	49 10	16	1 91	47 81	8	2 71	47 65	8	2.06	51 20	11	3 57
48.45	49.24	1	–	52.75	15	2 51	51 18	8	3 48	50 28	11	1.61	53 60	10	4 30
52 51	75 17	4	7 01	76 58	18	3 18	77 12	9	2 41	78 36	22	4 69	78 20	4	1 37
54 55	51.80	4	1 94	47 96	18	3 33	49 90	9	3 29	51 67	23	3.39	48 10	3	0 82
DS DC	61 28	4	13 00	56 31	13	10 51	58 76	9	7 17	52 10	14	9 22	58 20	11	7 94
SS SC	49 62	5	15.20	47 91	16	10 66	49 89	9	8 91	50 42	16	11 03	50 00	11	12 34

Table 5. Significant empirical-to-standard variance ratios in male cranial series from Andronov (Fedorov) burials

Trait codes	Baraba forest-steppe			Kuznetsk Basin			Upper Ob			Tomsk area			Minusinsk Basin		
	n	s	F-st	n	s	F-st	n	s	F-st	n	s	F-st	n	s	F-st
1	9	5 53	–	19	8.50	1 94*	10	5 80	–	25	7 83	–	22	6.71	–
8	9	4 53	–	19	4.88	–	10	4 19	–	18	7 39	2 18*	22	6.12	–
17	7	5.56	–	17	7 01	2 04*	10	7 83	2 55*	15	5 62	–	21	4 03	–
5	7	2 43	–	17	5.89	–	10	6 43	2 46*	13	5 91	–	21	3 55	–
10	7	3 74	–	19	4 83	–	11	4 68	–	23	6 90	2 07*	18	4 47	–
45	7	3 15	–	16	4 51	–	9	5.15	–	14	4.35	–	20	7 94	2 42**
DC	5	1 21	–	15	2 60	–	9	2 30	–	24	3.30	2.25**	17	3 53	2 57*
SS	9	1 33	–	17	1 28	2 02*	9	1.11	–	29	0 85	–	18	0 96	–
72	7	6 05	4.35*	16	2 88	–	10	3 90	–	9	4 27	–	17	3.25	–
75(1)	6	4 37	–	16	5 77	–	10	5.34	–	23	5 25	–	16	6.64	2 08*
8 1	9	3 63	–	19	4 95	2 39*	9	3 73	–	18	4 02	–	22	3 19	–
17 8	7	4 49	–	17	7 67	3 04**	9	4 85	–	7	7 13	–	20	4 37	–
54·55	8	4 72	–	19	6 20	2 29*	10	5 85	–	30	3 38	–	20	3 25	–
DS.DC	5	8 23	–	14	12 51	2 19*	9	10 35	–	22	7 51	–	17	10 69	–

* $P < 0.05$
** $P < 0\ 01$

Table 6. Significant empirical-to-standard variance ratios in female series from Andronov (Fedorov) burials

Trait codes	Baraba forest-steppe			Kuznetsk Basin			Upper Ob			Tomsk area			Minusinsk Basin		
	n	s	F-st	n	s	F-st	n	s	F-st	n	s	F-st	n	s	F-st
10	8	8 43	3.26*	17	5 19	–	11	6 35	–	14	4 09	–	9	6 51	–
DS	4	2 05	–	13	2 12	2 66*	9	1 02	–	14	1 77	–	11	1 06	–
SS	4	1 45	–	16	1.13	2 61*	9	0.97	–	16	0.79	–	11	1 25	3 19*
32	6	3 82	–	16	5 43	2.15*	9	4.74	–	7	2 73	–	11	3 96	–
72	5	6 59	5 16*	15	3 85	–	9	4 24	–	7	3.34	–	10	2 59	–
74	5	7 17	–	15	6 43	–	9	6 03	–	7	6 56	–	9	4 50	–
8 1	8	5 83	3 32*	17	3.90	–	12	2 94	–	15	3 59	–	12	4 27	–
17·1	5	3 65	–	17	4 80	2 40*	10	3 24	–	13	1 52	–	13	3 78	–

* $P < 0\ 05$

Basin join the Fedorov people of Kazakhstan and Minusinsk, as well as the Timber Frame people of the Lower Volga. The same cluster includes a series from Gumugou, which Han Kangxin (1986) associates with the Afanasyev Culture. However, he notes its close similarity with the Andronov group from Minusinsk, based on measurements published by Debetz.

The arrangement of groups in the female dendrogram is different, however (Fig. 2): The Fedorov series from West Siberia, except that from the Upper Ob, joined the Okunev and Krotov people. All of these together form a separate cluster, whereas the remaining Early and Middle Bronze Age groups from the Eurasian steppes fall into another cluster.

In terms of typological definitions given by previous writers, the two male clusters include various subtypes of the Proto-European trait combination, which Debetz (1948: 328) described as Cro-magnoid *sensu lato*. One of them includes groups with the Andronov trait combination, both with and without the local West Siberian admixture (supposedly Mongoloid);

Table 7. Results of discriminant analysis of Bronze Age cranial series

Trait codes	Males		Females	
	DF 1	DF 2	DF 1	DF 2
75(1) Nasal prominense angle	0.802	0.369	0.570	-0.460
8 Cranial breadth	-0.174	0.640	-0.160	-0.798
DS Dacryal subtense	0.362	-0.043	0.507	0.114
32 Frontal profile angle (n)	-0.026	0.080	0.053	-0.002
51 Orbital breadth (mf)	-0.291	0.274	-0.180	-0.106
17 Basion - bregma height	0.237	-0.275	0.350	0.191
Zygo-maxillary angle	-0.367	0.255	-0.367	-0.181
SS Simotic subtense	0.292	0.068	0.364	-0.003
77 Nasomalar angle	-0.276	0.150	-0.324	-0.114
54 Nasal breadth	-0.108	0.081	-0.020	-0.120
DC Dacryal chord	-0.058	-0.082	-0.088	-0.034
9. Minimal frontal breadth	0.146	0.200	0.159	-0.278
45 Zygomatic breadth	-0.180	0.310	-0.243	-0.280
48 Upper facial height	-0.101	0.221	-0.020	-0.229
1 Cranial length	0.121	0.139	0.046	-0.103
55 Nasal height	-0.025	0.090	0.024	-0.097
52 Orbital height	-0.198	0.104	-0.131	-0.176
SC. Simotic chord	0.124	-0.041	0.143	0.035
72 Total facial angle	0.053	0.252	0.173	-0.280
Eigenvalues	3.214	1.259	2.931	1.261
Per cent of variance	0.448	0.623	0.463	0.662

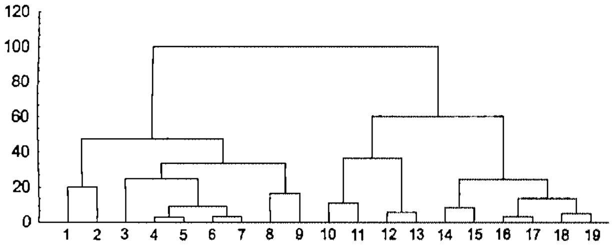

Fig 1 Dendrogram based on the results of cluster analysis of male cranial series Numbers refer to cultures and localities with which the samples are associated

1 – Catacomb Culture, the Volga, 2 – Andronov (Alakul) Culture, Western Kazakhstan, 3 – Pit Grave Culture, the Dnepr, 4 – Catacomb Culture, the Dnepr, 5 – Afanasyev Culture, the Altai, 6 – Pit Grave Culture, the Volga, 7 – Afanasyev Culture, Minusinsk, 8 – Tazabagyab Culture (Kokcha-3), 9 – Fedorov Culture, Baraba forest-steppe; 10 – Cherkaskul Culture (Krasnogorsky); 11 – Okunev Culture, 12 – Krotov Culture, 13 – Fedorov Culture, Tomsk (Yelovka-2), 14 – Fedorov Culture, Minusinsk; 15 – Fedorov Culture, Kuznetsk, 16 – Timber Frame Culture, the Volga, 17 – Fedorov Culture, Kazakhstan; 18 – Afanasyev Culture, Xinjang (Gumugou), 19 – Fedorov Culture, the Upper Ob

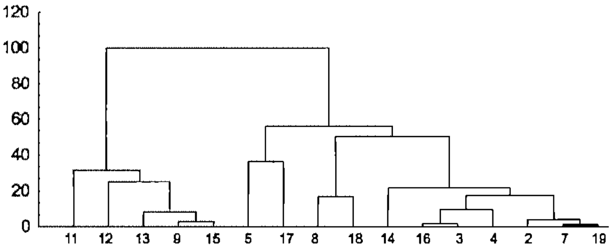

Fig. 2 Dendrogram based on the results of cluster analysis of female series Sample numbers are the same as in Fig. 1

another, Proto-European groups with and without the Proto-Mediterranean admixture. The former cluster is comprised of groups associated with the Samus or Timber Frame – Andronov cultural provinces, the latter includes those from the Pit Grave – Catacomb province.

The female dendrogram reveals little if any correspondence with cultural attribution. A separate position is taken by groups with a local West Siberian admixture. Groups without it have formed a large cluster, within which Afanasyev and Fedorov people of Minusinsk, and the Fedorov population from the Upper Ob join the Andronov people of Western Kazakhstan and those of the Pit Grave, Timber Frame, and Catacomb populations of the Russian Plain. Consequently, in females, the Proto-European trait combination is not subdivided into a subtype associated with the Pit Grave, Catacomb, and Timber Frame cultures, and one associated with the Andronov cultures. Incidentally, Alekseyev, in one of his last publications (1989), noted that the morphological distinction between the Andronov and Afanasyev trait combinations was evident only in the Minusinsk area.

The leveling of differences between female groups from the Eurasian steppes may be explained by the preservation, in females, of the archaic traits of the Proto-European complex. According to the idea which Debetz (1936) advanced, and which has remained unchallenged, "the Cro-magnoid combination in the broad sense" encompassed all ancient European-derived populations and was ancestral for all other variants of the European complex. It was later demonstrated that the Proto-European combination was distributed all over the Eurasian steppes even before the formation of the Pit Grave and Afanasyev populations (Alekseyev, 1961, 1974; Gokhman, Vlček, 1991; Mamonova, 1980). In the Neolithic, the eastern part of its distribution area included the steppes of the Yenisei area and the Mongolian Altai. Based on this, the hypothesis of a mass migration of Europeans to South Siberia had to be revised. Alekseyev (1989) suggested that the Afanasyev people were autochtonous. The common ancestral population would account for a physical similarity between them and the Pit Grave people. The same population might have been ancestral to the Andronov people as well.

Concerning the position of the Fedorov groups in the dendrograms, several conclusions can be drawn. Most importantly, the Andronov populations in various parts of their distribution area, southern (the Upper Ob) and northern (the Tomsk area of the Ob) evidently differ by origin. While the southern Fedorov populations likely descended from the basic proto-population associated with the Timber Frame (Andronov cultural province), the northern ones preserved traits particular to the earlier population associated with the Samus-Seyma cultural tradition. Cranial features of male and female Fedorov samples from the Kuznetsk Basin and the Baraba forest-steppe demonstrate various ties with these traditions. The male series from Kuznetsk displays features typical of the Andronov variant of the Proto-European complex, being similar to the Fedorov series from Kazakhstan, Minusinsk, and the Upper Ob. The male population from Baraba is closer to the variant represented by the Afanasyev and Pit Grave – Catacomb groups of the Eastern European forest-steppe. Both the female series, in contrast, have joined a rather homogeneous cluster formed by groups related to the Samus – Seyma populations.

Conclusions

Based on the above observations, we can attempt to reconstruct the pattern of genetic heterogeneity of the Andronov populations in West Siberia.

The first fact to be mentioned is that within-group homogeneity of the groups analyzed implies their prolonged coexistence in the same territory, with their closest neighbors being the ancestral North Eurasian populations. The period of coexistence must have been longer than just one century, which is commonly allotted to the Andronov sites of West Siberia by the archaeologists.

In the Andronov (Fedorov) populations of West Siberia, three trait combinations can be traced. Two of these are related to the Proto-European complex, introduced to West Siberia by a migration of Fedorov tribes from an area where this culture had formed; one combination is autochtonous. The most intense hybridization between immigrants and the indigenous groups took place in the Baraba forest-steppe and in the Kuznetsk Basin, where male and female groups differ in terms of genetic affinities. In the Upper Ob and the Minusinsk Basin, the Andronov populations show only Proto-European features. This may be due to two factors: the relative isolation of immigrants in these areas, and the presence of the same genetic component in both the immigrant and local populations.

In the northern part of the Andronov cultural province (the Tomsk area of the Ob River basin), the Proto-European trait combination is the least expressed probably because in this region, the principal factor in the distribution of Andronov elements was cultural diffusion, rather than hybridization.

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NEW EVIDENCE ON THE POSSIBLE COLLATERAL RELATIVES OF AMERICAN INDIANS IN BRONZE AGE SIBERIA*

Lipsky (1969) noted some parallels between the Okunev burial stelae and certain elements of North American Indian ritual art. As our skeletal studies have demonstrated, the Okunev people as well as those who lived in the Baraba forest-steppe during the pre-Andronov stage of the Bronze Age (Sopka-2) displayed a distinctly "Amerindian" tendency in two independent systems of cranial traits: nonmetric and metric (Kozintsev et al., 1995, 1999).

In order to test whether the same applies to any modern groups, we have enlarged the database. The total number of series used in the present study is 26 (the number of individuals studied by us with respect to nonmetric traits is indicated in parentheses; sources of metric data are given in (Kozintsev, Moiseyev, 1995; Gromov, 1997; Moiseyev, Kozintsev, 1998; Moiseyev, 1999; Kozintsev et al., 1999)):

1. Caucasoids (2007), pooled series representing 21 modern ethnic groups: Russians (two samples), Ukrainians, Letts, Lithuanians (two samples), Estonians, Finns (six samples), Swedes, Karels, Abkhazians, Adygeys, Ossets (two samples), Chechens, Ingushes, Armenians, Pamirians, Poles, Hungarians, Bulgarians, Italians, Turks, and Arabs. For the former 15 ethnic groups, both metric and nonmetric data are available, whereas the latter six series were studied with respect to nonmetric traits only.
2. Uralians (748). A pooled series representing Khanty (six samples), Mansi, Nenets, and Selkups.
3. Siberians and Mongols (592) A pooled series consisting of Telengits, Yakuts, Buriats, Mongols, Tungus, Negidals, Nanays, Ulchi, Orochi, and Nivkhs. Tuvinians, who were included in this series in (Kozintsev et al., 1999), are now treated separately.
4. Tuvinians (68).
5. Shors (78).
6. Teleuts (55).

The following five groups (7 – 11) are Khakassians:

7. Kachins (78).
8. Sagays (47).
9. Kyzyls (192)
10. Koibals (40).
11. Beltyrs (30).
12. Tubalars (39).
13. Kumandins (83).
14. Kets (21).
15. Arctic Mongoloids: Eskimos of Chukotka, Alaska, and Canada, Aleuts, and Chukchi (681).
16. Indians of North America, mostly modern and late pre-Columbian, 2nd millennium AD (157). The largest samples represent Haida, Tlingit, Iroquois, a group from Cahokia, Illinois, and populations of Arizona and New Mexico, whose tribal attribution is unknown.
17. Indians of South America, mostly Peru and Argentina, pre-Columbian, 1st and 2nd millennia AD (169).
18. Baikal Neolithic and Chalcolithic, mostly 4th and 3rd millennia BC (73).
19. Afanasyev Culture, the Upper Yenisei and the Altai, late third millennium BC (66).
20. Okunev Culture, the Upper Yenisei, late 3rd or early 2nd millennium BC (142).

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Principal component (PC), canonical variate (CV),
and integral principal component (IPC) scores

Groups	PC 1	PC 2	CV 1	CV 2	CV 3	CV 4	IPC 1	IPC 2
Caucasoids	–1.90	0.25	–1.80	–1.34	–0.18	0.63	–2.21	0.35
Uralians	0.19	0.56	0.82	–0.24	–0.11	–0.08	0.44	0.47
Siberians and Mongols	2.05	1.07	2.25	0.19	0.57	0.28	1.74	1.83
Tuvinians	2.31	1.83	1.81	0.20	1.18	0.48	1.40	2.53
Shors	1.27	–0.35	0.28	–0.98	–0.82	0.04	0.79	0.04
Teleuts	–0.50	0.35	0.37	–0.16	–0.30	0.54	–0.43	0.95
Kachins	0.86	1.14	1.02	0.14	0.51	–0.15	0.80	0.89
Sagays	1.06	0.76	0.31	–0.66	1.04	–0.18	0.63	0.48
Kyzyls	0.44	0.73	0.58	0.63	–0.56	0.08	0.32	0.77
Koibals	–0.34	–0.45	1.34	0.04	0.25	0.11	0.52	0.10
Beltyrs	0.78	0.63	0.59	0.68	–0.31	–0.19	0.66	0.39
Tubalars	–0.75	0.35	0.82	–0.18	–0.74	0.83	–0.50	1.39
Kumandins	0.71	0.24	0.21	–0.09	–0.77	0.72	–0.01	1.23
Kets	1.41	–1.02	1.36	–0.06	–0.67	–0.10	1.59	–0.33
Arctic Mongoloids	1.86	–0.85	1.22	–0.08	0.43	–0.66	2.03	–0.91
North American Indians	2.03	–1.96	–0.38	–0.64	–0.10	–0.82	1.61	–2.19
South American Indians	0.26	–2.47	0.35	–1.35	–0.66	–1.19	1.42	–3.09
Baikal Neolithic and Chalcolithic	0.25	–0.80	0.85	0.25	0.49	0.40	0.45	0.21
Afanasyev Culture	–0.99	–0.19	–2.48	–0.09	1.00	0.53	–1.97	–0.11
Okunev Culture	–0.37	–0.50	–1.30	0.76	0.95	–0.63	–0.37	–1.49
Sopka-2	–1.13	–1.27	–0.24	0.98	–0.49	–0.53	–0.13	–1.74
Andronov Culture	–1.88	1.14	–2.36	0.08	0.24	0.01	–2.27	0.01
Yelovka II	–2.76	–1.06	–0.75	1.57	–0.78	–0.23	–1.38	–1.52
Karasuk Culture	–1.21	1.01	–1.34	0.06	0.37	–0.21	–1.31	–0.06
Irmen Culture	–1.88	0.25	–1.85	0.62	–0.78	0.26	–2.01	–0.14
Tagar Culture	–1.79	0.63	–1.63	–0.32	0.26	0.08	–1.83	–0.06
Percent of variation	40.3	21.1	52.4	13.5	12.6	7.4	44.6	39.2

Note. IPCs have been calculated on the basis of PC 1, PC 2, CV 1, and CV 4. See text for explanations.

21. Sopka-2, the Upper Ob – Irtysh watershed, mostly Krotov Culture, late 3rd – early 2nd millennium BC (195).

22. Andronov Culture, South Siberia and Northern, Central, and Eastern Kazakhstan, 2nd millennium BC (154).

23. Yelovka II, Andronov period, the Ob, Tomsk area (78).

24. Karasuk Culture, the Upper Yenisei, early 1st millennium BC (229).

25. Irmen Culture, the Upper Ob and the Ob – Irtysh watershed, early 1st millennium BC (125).

26. Tagar Culture, the Upper Yenisei, mid-1st millennium BC (117).

Because many Amerindian crania are artificially deformed, we have used only facial traits, supraorbital foramina being the only exception. The nonmetric traits used were shown by us to be very informative for population studies (Kozintsev, 1988, 1992). They include spheno-maxillary suture, os japonicum posterior trace, infraorbital pattern type II (longitudinal infraorbital suture overlaid by the zygomatic bone), transverse palatine suture index (frequency of sides where the foremost point of the suture coincides neither with the palatine spine nor with the point where it touches the medial palatine suture), and supraorbital foramen. Craniometric traits include ten measurements of the facial skeleton: bizygomatic breadth, upper facial height, nasal and orbital height and breadth, nasomalar angle, zygo-maxillary angle, nasal prominence angle, and simotic index.

At the first stage, trigonometrically transformed frequencies of nonmetric traits were subjected to the principal component analysis, and measurements were subjected to the canonical variate analysis with a pooled within-group correlation matrix. The results are presented in the Table.

The first principal component (PC 1) in the analysis of nonmetric traits accounts for 40% of their variation and reflects the west-to-east (resp. Caucasoid-to-Mongoloid) gradient. Traits with the highest loadings on this component are os japonicum trace, supraorbital foramina, and, with the reverse sign, transverse palatine suture index.

The same tendency is reflected by the first canonical variate (CV 1) in the analysis of craniometric traits, accounting for 52% of their variation. The highest correlation with this CV is shown by transverse facial profile angles, upper facial height, and, with the reverse sign, measures of nasal prominence.

The correlation between PC 1 and CV 1 is rather high ($r = +0.75$, $P < 0.001$). It would be even higher if the North American Indians had not displayed a spuriously "Caucasoid" tendency with regard to measurements of the facial profile (this is a well known fact). In our study, they are craniometrically more "Caucasoid" than are any of the modern Siberian populations, including the undoubtedly hybrid ones. With regard to nonmetric traits, however, North American Indians are one of the most Mongoloid groups, surpassed only by Siberian Mongoloids including Tuvinians One of the most likely explanations of this discrepancy is that the ancestors of Amerindians had left North Asia before the flat face became a feature common to all human populations of that region (Roginsky, 1937) (see (Kozintsev, 1991) for a discussion of new facts and theories). South American Indians occupy a "neutral" position on both axes – PC 1 and CV 1

PC 2, accounting for 21% of the variance, opposes both Amerindian series to all the remaining ones. Traits with the highest loadings on this PC are infraorbital pattern type II and, to a lesser degree, spheno-maxillary suture (both are quite rare in Amerindians) Os japonicum trace, which is also rare in American natives, in contrast to modern Siberians, does not play an important role here since it is rare in Caucasoids as well. Further PCs will not be discussed both for formal reasons (their eigenvalues are less than 1), and because they are uninformative.

Returning to craniometry, CV 2 (13.5% of the variation) has apparently only one meaning: its mean score is significantly higher in ancient groups than in modern ones, regardless of origin (Wilcoxon-Mann-Whitney $z = 2.32$, $P = 0.02$, two-tailed). Prehistoric groups are characterized by broader face and orbits on average. This evidently reflects the gracilization tendency. In the following, CV 2 will not be used.

CV 3 (12.6% of the variation) does not contain any useful information. The distribution of groups along this axis appears quite erratic.

CV 4 (7.4% of the variance), in contrast, is informative since the regularity it reveals is the same as that revealed by PC 2 in the nonmetric analysis· both Amerindian groups are opposed to the remaining ones. Here, the "Amerindian" combination is that of a relatively broad face, high orbits, and low nasal aperture.

Amerindians are known to be biologically quite diverse. Amerindian craniology is a largely unexplored area, especially with regard to nontraditional traits such as those used in this study. The available material is anything but representative, especially with regard to the same traits. Also, the share of variation accounted for by both "Amerindian" vectors is small, especially in the craniometric analysis. Before proceeding further, then, it should be asked if the results may be due to chance.

The question is resolved without much difficulty. The probability that two specific series (in this case, Amerindian ones) would be opposed to 24 remaining ones by chance with regard to one system of traits is close to 0.006. The probability of this happening twice (with regard to two independent systems) is less than one chance per 26 thousand. If, however, the observed fact is not incidental, then it can be due neither to the scarcity of the available material nor the fact that it is unrepresentative (if this were so, it would be impossible to explain why vastly separated groups from North and South America have twice occupied the same extreme part of the scale). Nor, by the same token, can this be an artifact of the statistical analysis. Evidently, the only plausible explanation is that the natives of both parts of the American continent, all their heterogeneity and other sources of error notwithstanding, share certain common features, which have been revealed by our analysis.

All the above enables us to regard PC 2 and CV 4 as indicators of the "Amerindian" tendency. The latter is independent from the position of groups on the west-to-east axis, reflected by PC 1 and CV 1 (all the PCs are orthogonal, and so are the CVs). Debetz's opinion, expressed half a century ago, that "existing craniological techniques are unable to distinguish the crania of "Americanoids" from those of the Mongoloids with some Caucasoid admixture" (Debetz, 1951: 90) does not agree with the present state of the methodology.

The coefficient of correlation between both the "Amerindian" vectors, PC 2 and CV 4, equals 0.58 ($P < 0.01$). If both Amerindian series are excluded, it drops to 0.32 and becomes insignificant. Hence it follows that most groups we used do not differ with respect to the "Amerindian" tendency.

The minority of groups, however, displays a marked "Amerindian" shift, and it is precisely these groups that are of a special interest for us. In both systems of traits, the closest to the "Amerindian" extreme are the same series. Both in nonmetric and metric features, the four groups nearest to the Amerindians include Arctic Mongoloids, Sopka-2 and Yelovka II. As Fisher's exact test for a four-fold table indicates, this coincidence is nonrandom ($P = 0.008$). The six groups closest to the Amerindians include, apart from the above, the Okunev people, and this, too, cannot be ascribed to chance ($P = 0.018$).

The "Amerindian" tendency of the Arctic Mongoloids is not unexpected. Their intermediate position between the Siberians and the Amerindians has been noted more than once (see, e.g., (Debetz, 1951)). However, the fact that certain Bronze Age populations of South Siberia show the same tendency was revealed only recently – first with respect to the Okunev people (Kozintsev et al., 1995), then with respect to the population from Sopka-2 (Kozintsev et al., 1999), and finally, after the number of groups had been enlarged, with respect to the group from Yelovka II. As will be shown below, the "Amerindian" tendency is no less expressed in these prehistoric Siberian populations than in modern Arctic Mongoloids.

Other populations reveal no regularities in their proximity to the Amerindians with regard to the two trait systems. The possible exception is the Kets, whose supposedly "Amerindian" features were noted by past writers. Nonmetrically, the Kets are the third nearest group to the Amerindians on PC 2, but only the ninth nearest metrically (on CV 4). The Neolithic and Chalcolithic populations of the Cis-Baikal area, which were often regarded as the likely collateral relatives of the Amerindians, occupy the fifth and the eighteenth places, respectively. In none of the remaining series is the average rank of proximity to the Amerindians less than 10. In the Tuvinians, whose mtDNA displays Amerindian features (Derenko et al., 2002), this rank equals 21.5, which means that they are quite far from the Amerindians in both systems of cranial traits. This should come as no surprise since mtDNA reflects solely the history of the female part of the population, and the information it provides can be quite different from that provided by other trait systems.

As a next step, we integrated all meaningful information extracted from both systems. For that purpose, four vectors, PC 1, PC 2, CV 1, and CV 4, were regarded as new traits, and on their basis the principal component analysis was performed. In our view, this approach is optimal in terms of both technique (because it enables one to use traits with different dimensionality, in our case, frequencies and measurements), and interpretation, since the results are integrated on a level that is higher than usual (cross-systemic rather than within-systemic).

It is almost self-evident that integral PCs (IPCs) are a more powerful tool of analysis than are vectors based on separate systems (see Table). The first of them (IPC 1) reveals a contrast between Mongoloids (Amerindians included) and Caucasoids, the second one (IPC 2) opposes Amerindians to all the remaining groups.

The transition to the cross-systemic level makes it possible to correct certain inaccuracies, which are inevitable on the within-systemic level if only due to the scarcity of informative traits Because the vectors within each system are orthogonal, the new approach is based exclusively on cross-systemic correlations. At the cross-systemic level, the two tendencies, west-to-east, and "Amerindian," based on both systems, display a small positive correlation, which is probably random. For that reason, and because the correlation between both west-to-east vectors ($r = 0.75$) and both "Amerindian" ones ($r = 0.58$) is far from complete, all the four vectors contribute, although to an unequal degree, to each IPC. As a result, these are completely orthogonal The statistical "noise," caused not only by the deficiencies of the database, but also by the discrepancy between the evidence provided by various traits and even systems of traits, has thereby been minimized, whereas the information concerning the genetic affinities of the groups has been maximized.

Practically, this helped clarify the status of both Amerindian groups. As mentioned above, the North American Indians are spuriously "Caucasoid" in craniometric traits. On IPC 1, however, they occupy the third place with regard to the expression of the Mongoloid tendency, being exceeded only by Siberian and Arctic Mongoloids. The South American Indians are "neutral" on both west-to-east axes. However, they, too, are undoubtedly related to the Mongoloids, and the Caucasoid admixture, which cannot be ruled out despite the fact that the material dates from the pre-Columbian period, is incomparably smaller than the "quasi-Caucasoid" tendency observed in each system. On IPC 1, the South American Indians are quite Mongoloid and occupy the fifth place, close to the North American ones, as should be expected.

The first two IPCs jointly account for 84% of the between-vector variation, and hence for half the total variation (because the share of the variance jointly reflected by two selected vectors within each of the systems is about 60%). As the scatter diagram (Figure) indicates, this is a highly meaningful half, although it should be remembered that it reflects only two most important tendencies rather than the "general" relationships between the groups. Other tendencies, such as the peculiarity of the Uralic-speaking populations (Kozintsev, 1988; Kozintsev, Moiseyev, 1995; Moiseyev, Kozintsev, 1998; Moiseyev, 1999), are not revealed by this analysis (we have intentionally pooled the Uralic-speaking groups in order to exclude this aspect and avoid complicating the pattern).

In the space generated by IPC 1 and IPC 2, a triangular constellation of groups is observed, the angles of this triangle corresponding to Caucasoids, Siberian Mongoloids, and Amerindians, respectively. Most prehistoric South Siberian populations are situated in the left ("Caucasoid") corner, whereas most modern South Siberian ones, as well as the prehistoric group from the Baikal area, all of these being evidently hybrid, fall between the Caucasoids and the Siberian Mongoloids, as expected.

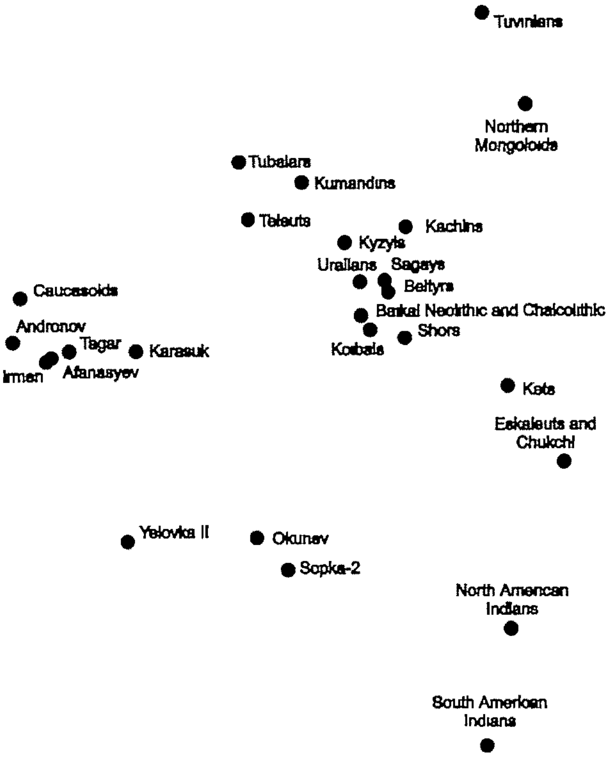
Groups situated along the right side of the triangle form a sequence that is easily interpretable in terms of both geography and history: Siberian Mongoloids – Arctic Mongoloids – North American Indians – South American Indians.

A distinctly "Amerindian" rather than Siberian Mongoloid direction of deviation from the Caucasoids is displayed by the three Bronze Age populations of South Siberia. the Okunev people and those from Sopka-2 and Yelovka II. They are separated from the Caucasoids by a considerable gap, and, despite being unquestionably hybrid (Gromov, 1997; Dremov, 1997), they are quite far from the cluster of groups formed by hybridization between Siberian Mongoloids and Caucasoids.

In our view, the observed pattern can have only one explanation. The three South Siberian Bronze Age populations mentioned above resulted from the hybridization between the Caucasoids and the prehistoric Mongoloids exhibiting an "Amerindian" tendency. It is impossible to specify the source of Caucasoid genes, because the level of inter-group differentiation we studied (Eurasian-American) is quite high. On this scale, within-Caucasoid differences appear negligible, so further studies are needed to resolve the question.

That "Amerindian" features can be traced in Siberia for at least seven millennia after the Amerindian ancestors had migrated to the New World, is no wonder, given that the traits studied are stable and the methods used are reliable. Does the "Amerindian" tendency, however, attest to actual ties with the ancestors of the New World populations? Is it warranted to speak about the collateral relatives of Amerindians, as we did before (Kozintsev et al., 1999)?

To answer this question, we should consider one fact, which has emerged only now, after the number of groups was enlarged. Regardless of the position of groups on the west-to-east axis (IPC 1), the mean IPC 2 score in prehistoric populations is significantly closer to the "Amerindian" extreme than is the mean score in modern populations (Wilcoxon-Mann-Whitney $z = 3.43$, $P < 0.001$, two-tailed). The difference between ancient and modern groups of Eurasia on IPC 2 is even larger than on CV 2, although in the former case, in contrast to the latter, this cannot be attributed to a universal diachronic tendency, since Amerindian series date from relatively recent periods. Neither can the result be explained by the Caucasoid admixture in Amerindians, because virtually no evidence of such an admixture has been found in our study (see below). Therefore, only one plausible explanation remains: in the course of evolution, the Siberian Mongoloids have lost the features inherited from the common Mongoloid ancestors, whereas the Amerindians have retained them. That these traits may indeed be quite ancient is indirectly evidenced by the fact that the same regularity, although on a smaller scale, holds for Caucasoids: among them, the modern Caucasoid series is the furthest from Amerindians on IPC 2. The possible conservation of proto-Mongoloid traits in the Amerindians and, to a lesser degree, in the Arctic Mongoloids, has been discussed more than once (see, e.g., (Roginsky, 1937)).



Position of groups with respect to IPC 1 (x-axis) and IPC 2 (y-axis). See text for explanations

If so, then the "Amerindian" tendency observed in three Bronze Age populations of South Siberia does not necessarily point to any specific genetic affinities with Amerindian ancestors. Rather, it may attest to the considerable antiquity of the traits in question. They could have been widely distributed and could have formed various combinations.

This may be illustrated by the results of the craniometric analysis, which we carried out using the same database, but with the addition of Neolithic groups from the Upper Ob (Dremov, 1997) and the Trans-Baikal region (Mamonova, 1983), and with the subdivision of a pooled (and hence uninformative) Neolithic and Chalcolithic group from the Cis-Baikal region into several subpopulations (Ibid.). Of all these groups, the "Amerindian" tendency was displayed, unexpectedly, only by the Neolithic group from the Trans-Baikal area, one in which Mongoloid features are the most expressed.

We were unable to perform the nonmetric analysis with the same dataset due to a lack of data. Craniometrically, however, none of the Cis-Baikalian subpopulations, which several earlier writers believed to display the "Amerindian" tendency, show any shift toward the Amerindians. The same applies to the Neolithic population from the Upper Ob. This is yet another demonstration of the fact that, at the present stage of methodology, the "Amerindian" trait combination can no longer be confused with that resulting from hybridization between Caucasoids and Mongoloids. The presence of Caucasoid admixture in the Cis-Baikal populations and in those from the Upper Ob is beyond doubt. In fact, as our analysis suggests, the "Amerindian" tendency is not tantamount to the lesser expression of Mongoloid traits. Nor, vice versa, is facial flatness per se indicative of the modern Siberian Mongoloid combination. Many Amerindian populations are known to be flat-faced.

All the above does not render the issue of genetic ties between certain Siberian populations, including the three Bronze groups exhibiting the "Amerindian" tendency, and the Amerindian ancestors irrelevant. Further studies are required, especially in view of the parallels between the Okunev and Amerindian art, pointed out by Lipsky (1969).

In none of the modern Eurasian populations which we have studied, Arctic Mongoloids excluded, has the "Amerindian" tendency been discovered. The only exception may be the Kets, in which this tendency, while possibly present, is statistically insignificant. Linguistically, the Kets are unrelated to other modern Siberians. Certain facts point to their affinities with the southern Mongoloids (Gokhman, 1982). The latter appear to have retained the proto-Mongoloid genetic heritage to an even larger degree than have the Amerindians (Kozintsev, 1991). However, because the southern Mongoloid series have not been used in the present study, we refrain from discussing the matter any further.

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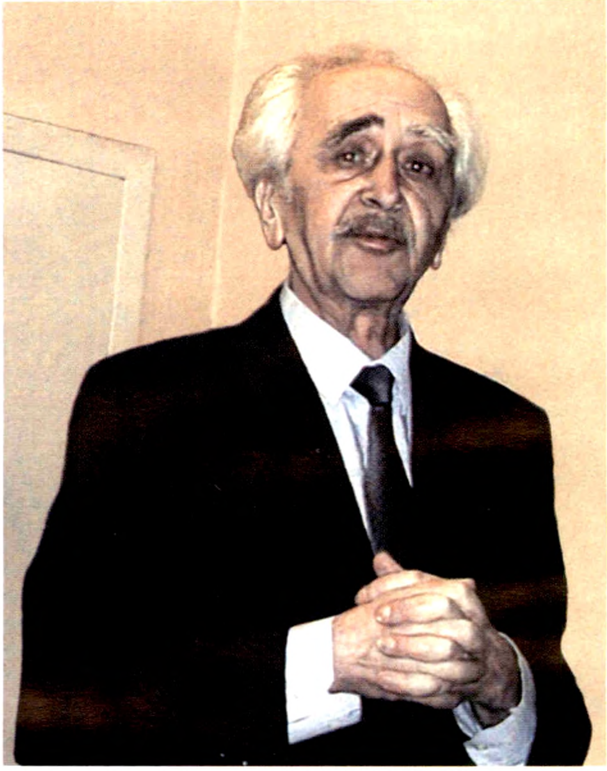
ILYA IOSIFOVICH GOKHMAN

On May 26, 2003 Ilya Iosifovich Gokhman completed his 75th year.

I.I. Gokhman was born in Novograd-Volynski. The war began when he was barely thirteen. The boy was evacuated, and his father died at the front while defending Leningrad from the German troops. In 1948, Gokhman entered the Leningrad University Department of History (Chair of Archaeology). Having graduated in 1952, he taught history at an evening school for young workers for three years, cherishing a dream of an exotic and fascinating profession: physical anthropology. During summer vacations, he practiced field archaeology, conducting excavations at a Paleolithic cave site on the Bukhtarma, Eastern Kazakhstan (the results were published in 1957).

In 1954, Gokhman's first publication appeared, based on crania from the Early Bronze Age (Glazkovo) graves at Fofanovo, Trans-Baikal region. This article triggered a discussion. At that time, G.F. Debetz himself was hesitant as to whether the lesser expression of Mongoloid traits in the Neolithic people of the Cis-Baikal region was due to plesiomorphic ("Americanoid") ancestry or to Caucasoid admixture. The solution was expected to come from the eastern side of Lake Baikal. If the Mongoloid features would not be more pronounced there, this would point to the former possibility, otherwise the alternative explanation had to be favored. The Fofanovo people, however, did prove more Mongoloid than those living west of Lake Baikal. As a result, Gokhman attributed this to hybridization with the Mongoloid tribes of the steppe regions south of the lake. M.G. Levin disagreed. At that time, the dispute was hard to resolve, but once new materials had appeared, Gokhman conceded that Levin was right. Like Debetz, he never clung to his opinions when he saw them to be erroneous. His later ideas concerning the Baikal and other Siberian and Mongolian populations are summarized in his brilliant article on the origin of Central Asian people based on skeletal evidence (*Sbornik MAE*, vol. 36, 1980).



In 1956, Gokhman became a graduate student at the Institute of Ethnography Leningrad Division (now Museum of Anthropology and Ethnography), and in 1963 he received a degree equivalent to the Ph.D. The topic of his dissertation was *The Population of the Ukraine in the Mesolithic and Neolithic*. Already in his graduate years, though, he published a number of works on other topics such as the Bukhtarma cave site, human remains from the slab graves in the Trans-Baikal region, and a child's cranium from a Tripolye burial.

For more than three decades, beginning in 1969, Gokhman headed the Department of Anthropology at the Museum of Anthropology and Ethnography. Under his leadership, the Department became one of Russia's principal anthropological centers. Gokhman can be viewed as the founder of the Leningrad anthropological school. From 1959 on, he taught anthropology at the Leningrad State University Chair of Archaeology, and in 1968 he became a permanent staff member of the newly organized Chair of Ethnography and Anthropology. There, for the first time after a long break, the training of professional physical anthropologists began under his supervision. Nearly all specialists in this discipline working in St. Petersburg were trained either by Gokhman himself or by his former students. His former students presently also work in Bashkiria, Yakutia, Buryatia, and elsewhere.

While recollecting Ilya Iosifovich's lectures, which I attended 40 years ago, I remember that at that time I planned to become an archaeologist, but I changed my mind under his influence. The Department of History abounded in brilliant professors, but Gokhman stood out even among that highly talented group. Young, mustached, regally majestic and, on the exams, gloomily indulgent, he inspired us with profound admiration for scientific knowledge about humans. This knowledge appeared all the more attractive because of its being totally devoid of ideology. In 1963, at a department described as "ideological" by officials, in the "city of three revolutions," it was especially pleasant to learn and memorize for life that regardless of any political changes, the cervical part of the spine contains exactly seven vertebrae, the first of which is termed atlas, and the second one, axis, and this is an unshakable fact which no one will ever be able to abolish. And it was Gokhman who imparted this on us. Among other important things that I memorized, there was a particular law, which I termed "Gokhman's Principle," in honor of its discoverer. In obvious defiance of the Probability Theory, it says, "If a student cannot tell the left bone from the right one, his chance of making a correct guess is exactly nil."

Returning to Gokhman's graduate years, his supervisor was V.P. Yakimov, a gifted anatomist and anthropologist. This was the time when a heated argument was developing around the issue of Mongoloid genes in prehistoric Europe. E.V. Zhirov first expressed this view before the war. Its chief proponent was N.N. Cheboksarov, and later it was advocated by G.F. Debetz. Their opponents were V.P Yakimov and V.V. Bunak. While all the four contributed to the shaping of Gokhman's views and style, the deepest imprint, both scholarly and personally, was left by Debetz. At the later stages of the discussion, which still continues, this did not prevent Gokhman, from taking the standpoint of his former supervisor. He believes that the quasi-Mongoloid traits of certain ancient and modern Europeans such as the Lapps do not attest to Siberian affinities because they are derived from the Cro-magnon people, who lived when the modern pattern of geographical variation was only beginning to develop. This view is based on the study of Mesolithic human remains from the Southern Reindeer Island (Oleniy Ostrov) on Lake Onega, from Scandinavia, and from Brittany, as well as those of modern Lapps.

A large and representative series of Lapp crania, formerly unavailable in our museums, are now available thanks to Gokhman's efforts. It was he and his students who organized and carried out the collection of vast materials representing the Karels, the Komi, the Bashkirs, and the Yakuts (skeletal remains of the Kets and the Yemeni, also obtained by him, are scanty but no less important). Even in the Kunstkammer, one of world's largest depositories of anthropological collections, those assembled by Gokhman or by his students make up an appreciable share. Even more importantly, they were accumulated in a systematic manner, according to plan, not by accident as before. Given that these materials are recent, the task was even more difficult than the excavation of ancient cemeteries would have been. At present, it has become virtually impracticable both in Russia and elsewhere. The more valuable is everything we possess thanks to Gokhman.

Gokhman's main area of interest is the history of the population of Siberia, Central Asia, and Europe in the chronological range from the Paleolithic to the present. However, he has focused on other territories as well. Most notably, over the latest years, he has taken a special interest in the Near East. Over several field seasons, a team he directed under the Yemeni Project collected a huge body of anthropometric data on Yemeni populations, providing an opportunity to revisit the old issue of "southern" genes in Arabia. The analysis undertaken by Gokhman and his students decisively shifted the balance toward the late African rather than early Australoid origin of these genes. He is one of the contributors to Ilse Schwidetzky's fundamental *Rassengeschichte der Menschheit*, and *Anthropology of Asiatic Russia*, co-authored with his close friend V.P. Alexeyev (Moscow, 1984), remains the principal source of information concerning the population history of this region.

Gokhman has authored or edited a dozen books. The number could have been much larger, if he had followed an "extensive" type of research which makes it possible to produce, one by one, publications based on ready-made approaches and standard methodology. Each of his works exemplifies an "intensive" tendency in physical anthropology. He is constantly looking for new vistas and introducing new efficient traits, which are more and more difficult to find. Can many anthropologists boast of a patent for an invention? Hardly, but Gokhman can, and it concerns not some minor technical improvement, but a unique measuring device, craniometer, and a qualitatively new graphical and analytical approach to craniometry. Using it, one of Gokhman's students, Yu.K. Chistov, has accomplished and defended a brilliant dissertation.

Apart from his engineering capacities, Gokhman is endowed with skillful fingers and a special "tactile" sense of the material. It is no wonder that his technique of conservation has been used by archaeologists for decades His gift for restoration is unsurpassed by any of our living anthropologists. He also has shared certain technical secrets with the readers of *Population of the Ukraine in the Mesolithic and Neolithic* (Moscow, 1966).

Moreover, he is an excellent field worker, capable of collecting materials under extreme conditions. It is sufficient to recall the efforts he had to expend in order to extract crania of Kets from permafrost and to study nearly all of their living descendants scattered in small groups amidst the taiga. The results exceeded expectations. The collective volume based on findings of the Ket expedition (*Ketskiy sbornik. Antropologiya, etnografiya, mifologiya, lingvistika*. Leningrad, 1982) was a bit of a sensation, because, for the first time, the hypothesis that the ancestors of the Kets had migrated from remote southern territories was supported by biological evidence.

In Gorny Altai, which Gokhman traversed all over in 1969 while doing anthropometric studies, his undergraduates and graduates, myself included, felt 100 percent secure thanks to his presence The same feeling was experienced by young members of his expeditions to the Lena, the Yenisei, Karelia, and Yemen.

To those who are continuing what he had started, Gokhman is generous in a very special way. He finds it only natural not merely to hand over to his pupil for analysis a sizeable set of material collected by himself at the cost of strenuous efforts, but even to decline from being mentioned as the second author, let alone the first one. This is a unique quality indeed. Usually we observe something diametrically opposite.

Today we all, his pupils, followers, and simply friends, congratulate Ilya Iosifovich Gokhman and wish him much happiness.

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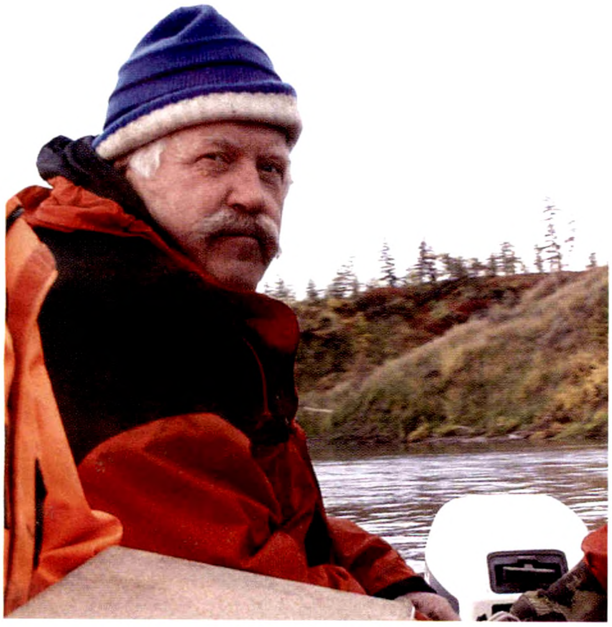
SERGEY NIKITICH ASTAKHOV



On April 24, 2003, Doctor of History Sergey Nikitich Astakhov, the Senior Researcher at the Institute of History of Material Culture (St. Petersburg) and a leading specialist in the Stone Age of Siberia and Central Asia, celebrated his seventieth birthday.

Astakhov's first steps in science were associated with the Department of Archaeology at Moscow State University. There, the young scholar, tutored by O.N. Bader, became engrossed with the prehistory of the Urals. In 1955, as a student, Astakhov participated in field investigations, which resulted in the discovery of the famous Paleolithic site of Sungir. His university graduation thesis was dedicated to the crucial Paleolithic locality of the Urals – the Talitskogo site.

A turning point in Astakhov's destiny was associated with A.P. Okladnikov, who had invited the young promising archaeologist to do his postgraduate studies in Leningrad. Since then, Astakhov's academic career has been tied with the Paleolithic Studies Department of the Leningrad Division of the Institute of Archaeology (presently the Institute of History of Material Culture), one of the oldest Russian research teams for studies of the Stone Age. On Okladnikov's initiative, Astakhov began to seriously work on collecting data relating to the Afontova Gora sites, which had been scattered over various archives and museum depositories. He successfully carried out this challenge and later presented the results of his research in his Candidate Dissertation titled *The Afontova Gora Sites and their Place in the Siberian Paleolithic*. This dissertation was brilliantly defended and recommended for publication. Unfortunately, this fundamental study was published 30 years later in the volume *The Paleolithic of the Yenisei: The Paleolithic Sites at the Afontova Gora in Krasnoyarsk* (St. Petersburg, 1999). In this book, Astakhov has introduced the term "Afontovskaya Culture" into the scientific circulation and suggested the relative chronology for stratified sites at Afontova Gora. Materials concerning the works of I.T. Savenkov, G.K. Mergart, N.K. Auerbach, V.I. Gromov, and G.P. Sosnovskiy present a considerable interest in terms of the history of Paleolithic studies in Russia.

Astakhov, using the F. Bordes' method, analyzed finds from Ust-Kanskaya Cave in the Altai and came to a trailblazing conclusion that the core materials of the lithic collection were of the Mousterian age. Thus, the chronological limits of the Paleolithic record in Siberia were significantly broadened. Astakhov's ideas about the character of the Upper Paleolithic in the Yenisei River basin and possible routes of human incursions into the Yenisei valley still retain their relevance.

Astakhov did not confine himself to only desk work. In 1959, the scholar participated in the excavations of the Fedyaevo site on the Angara River; from 1961 to 1963, he investigated the stratified localities of Kokorevo IV and IVA on the Yenisei. His name is inseparably linked with the Sayan-Tuva Expedition, one of the largest archaeological projects of the Soviet period. Starting from 1965, Astakhov functioned as the head of the Paleolithic team of this Expedition, and from 1973 on, as the director of the entire Expedition.

The first years of investigations in Tuva yielded more disappointments than achievements. Reconnaissance works conducted in the Ulug-Hem and Hemchik River valleys resulted in finding only scanty lithic materials. Investigations in southern Tuva turned out to be more successful. There, in the Sagly River valley, a series of Levallois – Mousterian and Upper Paleolithic localities were discovered. In 1971, the major works were moved to the northern portion of the Sayan canyon of the Yenisei. There, Astakhov discovered and investigated a series of supereminent prehistoric sites with well-preserved culture-bearing horizons. The discovery of a dwelling complex yielding an original blade-based industry at the Golubaya-1 site and the excavations of the stratified Kantegir-1 site of the Afontovskaya Culture are worthy of special attention.

Results of strenuous work, conducted by Astakhov over two decades, were summarized in the monograph *The Paleolithic of Tuva* (Novosibirsk, 1986) and in the collective volume *The Paleolithic of the Yenisei* (Leningrad, 1991). The investigations continued in southern Tuva yielded new results. In 1987, a series of impressive Acheulian hand-axes were found on the Torgalyk River. These discoveries allowed Astakhov to evolve a wide panorama of the prehistory of Central Asia in his fundamental paper *The Paleolithic of Tuva*, which he defended as his Doctoral Dissertation (1993). In this work, Astakhov described a series of the earliest Acheulian sites discovered in Tuva and related to the Mongolian Paleolithic Within the Middle Paleolithic, the scholar noted significant variability of lithic industries represented both by the Levallois-Mousterian assemblages, the Sagly sites and by pebble assemblages of the Irbetei and Pestunovka types. The researcher hypothesized the genetic affiliation of the local Acheulian and the Levallois – Mousterian. According to him, the Tuva Upper Paleolithic, represented by Ulug-Hem, Hemchik, and Southern groups of sites, shows even a greater variability of industries.

The scholar's unremitting work in Tuva was highly appreciated by the Tuvinan government. Astakhov was given a title of the Honorary Scholar of the Tuva Republic. He is a contributor to the fundamental book titled *The History of Tuva*, which was published in Novosibirsk in 2001.

Astakhov has always analyzed the Tuvianian assemblages within the wide context of the Asian Paleolithic record. Since the 1960s, the period of his work during the Soviet-Mongolian Archaeological Expedition, headed by A.P. Okladnikov, Astakhov has taken an interest in the Stone Age of areas of Asia outside of the Russian borders. Consequently, he traveled about Nepal and the Japanese Archipelago. Astakhov has established especially close contácts with Japanese scholars. Results of his examination of Japanese prehistoric collections and sites were summarized in the book *The Paleolithic of Japan* (St. Petersburg, 1999). This book presents archaeological complexes of the Japanese Archipelago in their relationships with Paleolithic cultures of continental East Asia.

In recent years, Astakhov has delved into new computer techniques of archaeological research. He has created a computer database for the prehistoric sites of Tuva. Additionally, a new sphere of field investigations has emerged – the study of the earliest cultures in the North. Astakhov actively participates in the investigations (headed by V.V. Pitulko) conducted on Zhokhov Island and in the lower reaches of the Yana River, where occurrences of Paleolithic artifacts have been discovered. On behalf of his friends and colleagues we wish Sergey Nikitich Astakhov new successes with his latest studies of humans, which inhabited the lesser known regions of Siberia in the Stone Age.

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LIST OF ABBREVIATIONS

AN SSSR – The USSR Academy of Sciences

BNC SO RAN – Buryat Research Center of the Siberian Branch, Russian Academy of Sciences

DVNC AN SSSR – Far Eastern Research Center of the USSR Academy of Sciences

DVO RAN – Far Eastern Branch of the Russian Academy of Sciences

IAE SO RAN – Institute of Archaeology and Ethnography, Siberian Branch of the Russian Academy of Sciences (Novosibirsk)

IIFF – Institute of History, Philology, and Philosophy, Siberian Branch of the USSR Academy of Sciences (Novosibirsk)

IIMK RAN – Institute of History of Material Culture of the Russian Academy of Sciences (St. Petersburg)

MAE – Museum of Anthropology and Ethnography of the Russian Academy of Sciences (St. Petersburg)

RAN – Russian Academy of Sciences

SB RAS – Siberian Branch of the Russian Academy of Sciences

UrO RAN – Uralian Branch of the Russian Academy of Sciences

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